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THE WILSON BULLETIN

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THE WILSON ORNITHOLOGICAL CLUB

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HEAD OF EMERALD TOUCANET
(Aulacorhynchus prasinus prasinus)
From sketch in water-color by George Miksch Sutton, drawn from a freshly-killed male specimen taken near Tamazunchale, San Luis Potosí, April 26, 1939.

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THE WILSON BULLETIN
A QUARTERLY MAGAZINE OF ORNITHOLOGY
Published by the Wilson Ornithological Club

Vol. 52 DECEMBER, 1940 No. 4

BIRDS OF TAMAZUNCHALE, SAN LUIS POTOSÍ[1]

BY GEORGE MIKSCH SUTTON AND THOMAS D. BURLEIGH

TAMAZUNCHALE[2] is one of the best known, as well as one of the most interesting towns the tourist passes through in following the main highway from Laredo, Texas to Mexico City. It is situated on the Moctezuma River, at about 300 feet elevation, in extreme southeastern San Luis Potosí. Immediately south of it rise well-wooded mountains whose crowns and sides are patched with tiny clearings, corrals, and corn fields. In the shelter of the larger trees carefully tended coffee bushes grow, some of these "plantations" occupying level stretches of flood-plain, others clinging to steep slopes far above the river.

The forest about Tamazunchale can hardly be called dense, though it is tropical in character. There are, however, impenetrable tangles in the cut-over districts as well as along the forest edge; and the rough mountainsides, with their shaggy blanket of moss, ferns, and vines, are difficult to scale, almost the only safe route to higher elevations being the improved road itself or the dry, tortuous, boulder-strewn beds of streams.

The 1939 Semple Expedition spent a little more than two weeks investigating the Tamazunchale section, part of a day March 26, and the period from April 14 to 29. The junior author participated for a comparatively short time, finding it necessary to start north for the United States April 17.

On March 26 the three-man party worked a fine woodland near the Rio Axtla, twenty miles north of Tamazunchale. Here, even close to the highway, birds were abundant and noisy. From April 14 to 16 inclusive the immediate vicinity of Tamazunchale was thoroughly explored, especial attention being paid to certain brushy woodlands north of town, and to the crudely cultivated banks of the river. From April 17 to 29 Semple and Sutton visited several more or less distant places in addition to the Rio Axtla woodland

[1] Third of a series of papers on the 1939 John B. Semple Expedition to eastern Mexico.

[2] Present-day spelling of Temaxteocali, said to have meant "Temple of the Toad God." The town is familiarly known among tourists as "Thomas and Charlie."

above referred to—the vicinity of Palitla, a village just over the ridge to the north of Tamazunchale; the flat country about Matlapa and Jalpilla, villages a few miles north of Palitla; and the banks of the Moctezuma and certain wooded ravines from four to ten miles south of Tamazunchale. A brief visit was made to the village of Axtla (on the Axtla River, a few miles east of the main highway) April 25; and on the way north to Valles, on April 29, important stops were made near Xilitla and at El Xolol.

On April 26 the senior author chanced to follow a dry stream bed back from the highway several miles into the mountains. Here, at a point which must have been ten miles south or southeast of Tamazunchale, and at an elevation of between 2,000 and 3,000 feet, he came upon a clear, cool stream, a fair-sized torrent that appeared to originate as a fall, that slipped swiftly along the base of the mother-cliff for several hundred yards, roared as it widened and changed course, then suddenly disappeared underground. Enchanted with this weird and beautiful thing, he returned on the two following days. Far above him, back and forth across the face of the vine-hung cliff, huge flocks of green parakeets flew. At a distance they looked like young leaves stripped from the treetops and blown by a fierce wind. Their screeching could be heard even above the noise of the cataract; but a more memorable sound was the ear-splitting squawks of the macaws that flew, pair by pair, overhead. The tall *jobo* trees were laden with ripe fruit. Here the parrots, big, middle-sized and little, came to feed. Other animal life was scarce, though now and then a squirrel barked, a hummingbird darted by, or a huge damsel fly idled past on wings that flashed steel-blue and silver.

The following list of 142 forms is considerably larger than that made by the Semple Expedition at Valles[3], less than 70 miles to the north. There are several reasons for this. First, more time was spent at Tamazunchale—a total of 432 man-hours in the field, as against the 240 man-hours spent at Valles. Second, at Tamazunchale much work was done along the Moctezuma and Axtla Rivers and certain of their tributaries, whereas at Valles no work was done along any stream. Third, the topography and vegetation are much more varied at Tamazunchale than at Valles. Because of the abundance of tree growth at the former place it is quite possible that many familiar birds of the eastern United States (such as the Baltimore Oriole, Catbird, Indigo Bunting, and Rose-breasted Grosbeak) winter regularly there but not at Valles or that, in their spring migration, they linger at the foot of the mountains near Tamazunchale, then fly *over* the Valles district to more favored feeding- or resting-grounds farther north.

The authors gratefully acknowledge the assistance of members

[3] Only 87 forms (species and subspecies) were recorded at Valles at virtually the same season (*Condor*, 42, 1940: 259–62).

of the staff of the following institutions: the Museum of Comparative Zoology at Harvard College; the American Museum of Natural History; the United States National Museum; and the Fish and Wildlife Service of the United States Department of the Interior. In particular do they wish to thank Mr. James Lee Peters, who was good enough to identify six swifts and a Wood Owl for them; and Dr. J. Van Tyne, who assisted in certain nomenclatural problems.

Crypturellus cinnamomeus (Lesson). Cinnamomeous Tinamou. Encountered only in brushy woodlands in low, comparatively flat country. Heard repeatedly a mile or so north of Tamazunchale and on April 18 in the vicinity of Jalpilla and Matlapa.

Poliocephalus dominicus (Linnaeus). Least Grebe. Two seen April 25 swimming slowly upstream along the Axtla River, not far from the village of Axtla.

Phalacrocorax olivaceus (Humboldt). Olivaceous Cormorant. Seen along the Moctezuma River several times, notably on April 16, when as many as twenty were counted; and along a small stream near Jalpilla, April 21, when six were seen.

Butorides virescens (Linnaeus). Green Heron. Recorded twice: April 17, when one was seen along the Moctezuma, four miles south of Tamazunchale; and April 21, when three were seen along a small stream near Jalpilla.

Florida caerulea (Linnaeus). Little Blue Heron. One in blue plumage seen near Jalpilla, April 21.

Casmerodius albus egretta (Gmelin). American Egret. Adult female, with full train of nuptial plumes, taken near Jalpilla, April 21 (Semple).

Querquedula discors (Linnaeus). Blue-winged Teal. Four pairs in a flock seen along the Moctezuma River seven miles south of Tamazunchale, April 17.

Coragyps atratus (Bechstein). Black Vulture. Noted every day. Especially common about the towns and along the improved roads.

Cathartes aura (Linnaeus). Turkey Vulture. Like the Black Vulture, a common and virtually ubiquitous species.

Ictinia mississippiensis (Wilson). Mississippi Kite. Recorded twice in the flat country just north of Matlapa, two being seen on April 18, one on April 20.

Buteo magnirostris griseocauda (Ridgway). Gray-tailed Hawk. Hawks were uncommon in the Tamazunchale region. The present species was noted occasionally in open, comparatively flat country. A nesting female, with well defined brood-patch, was shot April 19, along the Axtla River (Semple).

Asturina nitida plagiata Schlegel. Mexican Goshawk. Uncommon. One seen April 16 along the Moctezuma River not far from Tamazunchale. Breeding male taken near Matlapa, April 18 (Semple).

Pandion haliaetus (Linnaeus). Osprey. One seen flying along the Moctezuma River near Tamazunchale, April 24.

Micrastur semitorquatus (Vieillot). Collared Micrastur. One noted April 15, at dusk, a mile north of Tamazunchale.

Herpetotheres cachinnans chapmani Bangs and Penard. Mexican Laughing Falcon. Noted but once: a male, in soiled, badly worn plumage, taken near Jalpilla, April 18 (Semple).

Polyborus cheriway audubonii Cassin. Audubon's Caracara. Nesting pair encountered April 21, near Jalpilla. Not certainly identified elsewhere in the district.

Ortalis vetula vetula (Wagler). Chachalaca. Common in brushy woodlands. Female, with ovary somewhat enlarged, taken April 26 in shallow ravine leading back from the Moctezuma, seven miles south of Tamazunchale.

Colinus virginianus maculatus Nelson. Spotted-breasted Bob-white. Fairly common in open, brushy woodlands. Noted several times in the vicinity of Jalpilla

and Matlapa, a breeding male being taken at the latter place April 18 (Semple).

Tringa solitaria cinnamomea (Brewster). Western Solitary Sandpiper. The Solitary Sandpiper was recorded twice: a single bird seen at a woodland pool near the Axtla River, April 18; and a female collected near Matlapa, April 24 (Sutton). The belly plumage of the latter was somewhat stained with oil. This specimen is clearly of the western subspecies, the inner web of the outermost primary being marbled with grayish white at the base, the wing measuring 137 mm., the bill 34.

Actitis macularia (Linnaeus). Spotted Sandpiper. Single birds noted repeatedly along the Moctezuma River south of Tamazunchale, April 14 to 16.

Columba flavirostris flavirostris Wagler. Red-billed Pigeon. Noted daily along the borders of the heavier woodlands, especially near the Moctezuma River from four to seven miles south of Tamazunchale. Breeding male taken near Palitla, April 29 (Semple).

Zenaidura macroura (Linnaeus). Mourning Dove. Noted infrequently along the roads and in opener country. Small flock seen near Tamazunchale, April 24.

Zenaida asiatica asiatica (Linnaeus). Eastern White-winged Dove. Fairly common in the vicinity of Jalpilla and Matlapa, and along the Axtla River. Not seen south of Tamazunchale. Especially abundant north of the Axtla River in the vicinity of El Xolol where large flocks were seen along the highway and a breeding female was taken April 29 (Sutton). The wing of this specimen measures 150 mm., the tail 100.

Scardafella inca (Lesson). Inca Dove. Noted infrequently about the towns. Fairly common in Tamazunchale.

Columbigallina passerina pallescens (Baird). Mexican Ground Dove. Noted here and there in opener country wherever we went. Especially common about Matlapa and Jalpilla, where several pairs were breeding. At the former place a nest with egg and newly hatched young was found April 20, and a male (in irregular molt) was taken April 24.

Columbigallina talpacoti rufipennis (Bonaparte). Ruddy Ground Dove. Found wherever *C. passerina* was found, and commoner. Two nests with small young found and breeding male and female collected near Matlapa, April 24. Male taken at same place April 29.

Claravis pretiosa (Ferrari-Perez). Blue Ground Dove. Rare, but seen infrequently near Matlapa, Jalpilla and the village of Axtla. A pair, noted from time to time flying through Tamazunchale, must have been nesting in the very heart of town.

Leptotila verreauxi angelica Bangs and Penard. White-fronted Dove. Common wherever we went, being found singly or in pairs. A female (laying eggs) was taken April 20 at Palitla, and a male (testes much enlarged) was taken near Tamazunchale, April 27.

Leptotila plumbeiceps plumbeiceps (Sclater and Salvin). Plumbeous-headed Dove. Noted infrequently in well-wooded sections. Female with much enlarged ovary taken in flooded woodland near El Xolol, April 29 (Sutton).

Ara militaris (Linnaeus). Military Macaw. Scattered pairs seen April 18 (near Jalpilla), April 21 (along the Axtla River), and April 24 to 29 in wooded ravines leading off from the Moctezuma River, from four to eight miles south of Tamazunchale.

Aratinga holochlora holochlora (Sclater). Green Parakeet. Abundant in certain heavier woodlands along the Axtla and Moctezuma Rivers and at considerable elevations in the mountains (2,500 to 3,000 feet) where there were fruit-bearing trees. Specimens taken April 14 to 17.

Amazona viridigenalis (Cassin). Red-crowned Parrot. Noted infrequently in heavier woodlands along the Axtla River and four or five miles upstream from Tamazunchale along the Moctezuma. Pair and their nest discovered at latter place, April 20 (Semple). Breeding female taken along Axtla River, April 22.

On this date a Red-crowned Parrot was seen to attack and put to flight a Brown Jay that probably had invaded the former's nesting territory.

Piaya cayana thermophila (Sclater). Central American Squirrel Cuckoo. Fairly common in heavier woodlands, especially along the rivers. A female, taken April 26 in a well-wooded ravine seven miles south of Tamazunchale, was laying eggs.

Coccyzus americanus (Linnaeus). Yellow-billed Cuckoo. Noted but once, a single bird, near Jalpilla, April 21.

Crotophaga sulcirostris sulcirostris Swainson. Groove-billed Ani. Noted infrequently. Male taken near Jalpilla, April 19 (Semple).

Ciccaba virgata centralis Griscom. Central American Wood Owl. A mottled, middle-sized owl, presumably a Wood Owl, was noted at night on April 14, and again on April 15. Our only definite record, however, is of a male taken after dark five miles up the Moctezuma River from Tamazunchale on April 17 (Sutton). The eyes of this bird shone dull red in the rays of a strong flashlight. It gave a piercing screech. Its stomach contained but one item—a middle-sized, slender-legged, flesh-colored hairless spider.

Mr. James L. Peters has been good enough to compare our bird with the type of *C. v. tamaulipensis* (Phillips) at the Museum of Comparative Zoology He reports (in a personal letter to the senior author, dated November 18, 1940) on the comparison as follows: "Your bird has not only a darker ground color above, but the pale markings are much reduced in area and of a darker color; the broad silky feathers surrounding the facial disk have a brownish wash, with dark shaft streaks and edgings, whereas in *tamaulipensis* these same feathers are pure white externally, with dark bases. Below the two birds are marked about the same, but your specimen is more suffused with brownish across the breast and *tamaulipensis* has a buffy wash on posterior underparts."

Mr. Peters further states that our bird is "very close indeed to specimens of the pale phase of *C. v. centralis* and . . . an almost perfect match for a specimen of *centralis* from British Honduras."

Glaucidium brasilianum ridgwayi Sharpe. Ferruginous Pigmy Owl. Common wherever we went, its insistent hooting being heard during daylight hours as well as at dusk. Breeding pair taken two miles north of Tamazunchale, April 15. Nest with two fresh eggs found April 27, in stub about twelve feet from ground. The bird at the nest was the male. It called *while at the nest* (Semple). Nest with three fresh eggs found in deserted woodpecker hole about fifteen feet from ground near El Xolol, April 29 (Sutton). Male and female specimens taken April 15 to 29 represent both the grayish brown and rufescent phases of plumage.

Nyctidromus albicollis merrilli Sennett. Merrill's Pauraque. Fairly common in brushland near the rivers. The wing of a breeding male taken April 24 measures 174 mm.; that of a female (April 15) 174.5.

Caprimulgus serico-caudatis salvini Hartert. Salvin's Whippoorwill. Fairly common in brushlands at low elevations. One specimen taken: a male, with much enlarged testes, two miles north of Tamazunchale, April 20 (Semple).

Streptoprocne zonaris mexicana Ridgway. Mexican Collared Swift. Abundant along the Axtla River and at Matlapa and Jalpilla, April 18–20, hundreds being seen in the air at once. The birds could not have been far from their nesting-grounds, for the gonads of specimens captured were much enlarged. The wing measurement in two males is exactly the same: 211 mm.

Chaetura pelagica (Linnaeus). Chimney Swift. Small swifts, all of them more than likely of the genus *Chaetura*, were seen daily April 14 to 24. They could not be identified without shooting, however, and they were very difficult to shoot. Male and female specimens taken from foraging flocks neart Matlapa and at Tamazunchale April 18 to 23 prove, with one exception, to be common eastern Chimney Swifts[4]. None of them was in breeding condition.

[4] Identification of all specimens of *Chaetura* checked by Mr. James Lee Peters.

Chaetura vauxi (Townsend). Vaux's Swift. A female *Chaetura* collected from a rapidly circling flock near Matlapa, April 18, proves to be *vauxi*. The ovary was slightly enlarged.

Pampa pampa curvipennis (Lichtenstein). Curved-winged Sabre-wing. This interesting species, which we referred to familiarly as the "singing hummingbird," was encountered repeatedly from April 17 to 28 in woodlands not far from water. The "singing" males had favorite perches. Here they squeaked, chippered and sputtered, turning their heads nervously from side to side. They were very pugnacious and curious. If we crept through the underbrush toward them they frequently came to meet us, whirring down into our very faces, then backing up abruptly to settle upon one of their chosen "singing perches," where they chattered furiously.

A female taken April 24 at Palitla was molting about the head. The ovary of this specimen was considerably enlarged.

Amazilia yucatanensis cerviniventris (Gould). Fawn-bellied Hummingbird. Fairly common in shaded woodlands. The testes of a male taken along the Axtla River, March 26, were not enlarged. A female taken April 18, near Matlapa, was laying eggs. On April 20, at Palitla, a nest with two fresh eggs was found four feet from the ground at the side of a pleasant path through the forest. The brooding female did not fly off until the nest was touched (Sutton).

Chlorostilbon canivetii canivetii (Lesson). Canivet's Emerald. Noted daily from April 15 to the end of our stay, usually in opener, drier woodlands. Males frequently were to be seen perched on wires along the highway or on slender dead twigs that stuck up from the shrubbery. A male taken April 18 at Matlapa apparently is subadult, most of the belly feathers being grayish white rather than shining green at their tips.

Agyrtrina candida (Bourcier and Mulsant). White-bellied Emerald. Noted but once, a breeding male taken along a dry stream-bed in heavy woodland at about 2,500 feet on a mountainside above the Moctezuma River 7 miles south of Tamazunchale (Sutton).

Eugenes fulgens (Swainson). Rivoli's Hummingbird. Male noted April 24, near Palitla.

Anthracothorax prevostii prevostii (Lesson). Prevost's Mango. Two breeding males taken in open fields: April 16, near Tamazunchale; and April 22, along the Axtla River (Sutton).

Trogon ambiguus ambiguus Gould. Coppery-tailed Trogon. Noted with certainty but once: a female (ovary unenlarged) taken along the Axtla River, April 22 (Semple). This specimen is decidedly grayer on the head, chest, back, rump and upper tail coverts than average *T. a. ambiguus*. Noticeable grayish white barring on the tertials and inner secondaries, as well as the irregular, somewhat blotchy markings on the outer rectrices, probably indicate immaturity.

Trogon collaris puella Gould. Jalapa Trogon. Noted only in heavier woodland on mountainsides at from 1,500 to 2,500 feet elevation. Male taken April 27 seven miles south of Tamazunchale (Sutton). The call-note of this bird (and of the female, which was not collected) was a plaintive "kee-koo, kee-koo."

Trogon caligatus sallaei Bonaparte. Northern Gartered Trogon. The commonest Trogon of the region, and apparently the only species breeding at low elevations. We came upon it infrequently along shaded streams, finding it always in pairs. A nest found not far from the Axtla River, April 25, was at the end of a burrow among orchid roots, thirty feet from the ground in a great tree. Here our attention was first attracted by the peevish cries of the female bird, perched on a dead twig. She was seen to flutter time after time to the nest entrance, but she could not gain a foothold because the male was clinging there.

The birds were watched for some time. The male clung at the entrance for almost ten minutes. His tail was bent badly out of shape at the tip, presumably from being jammed in the nest. Finally he went in. The female now stationed

herself at the entrance, propping herself with her tail. She stayed there virtually motionless for ten minutes, then flew back to the dead twig to resume her crying. At length the male appeared, swooped briskly out, and the female, with an alacrity not often observed in trogons, fluttered to the nest and crept in (Sutton).

Megaceryle torquata (Linnaeus). Ringed Kingfisher. Noted but once, a single bird flying along the Moctezuma River near Tamazunchale, April 16.

Chloroceryle americana (Gmelin). Green Kingfisher. Noted but once: April 16, a single bird along the Moctezuma River several miles upstream from Tamazunchale.

Momotus coeruliceps (Gould). Blue-crowned Motmot. Fairly common in well shaded woodlands near the Moctezuma, males being collected April 14 and 27 (Semple and Sutton).

Ramphastos sulfuratus Lesson. Keel-billed Toucan. A large black toucan, with yellow throat, was seen April 13, not far from the Axtla River. It flew down from a hill-top to a huge, fruit-bearing tree to feed with mixed flocks of smaller birds (Sutton).

Aulacorhynchus prasinus prasinus (Gould). Emerald Toucanet. Noted repeatedly in heavier woodland along the Moctezuma River from six to ten miles upstream from Tamazunchale, male specimens being taken there April 14 and 26 (Semple and Sutton). In freshly killed birds the pupil was round, the iris dark brown, and the bill strikingly black, white, mahogany brown and light greenish yellow (see frontispiece).

The species was known locally as the "pájaro verde" or "green bird." We encountered it in small companies rather than in pairs, as a rule, finding it secretive and rather hard to see. The only call-notes we heard from it were low, hoarse croaks. One seen April 26 had a malformed (open) bill, the mandibles meeting only at the tip, the bold serrations along the culmen in consequence being unusually noticeable.

Chloronerpes aeruginosus (Malherbe). Lichtenstein's Woodpecker. Noted but twice: near Palitla, where one was seen April 24; and along the Moctezuma River, 7 miles upstream from Tamazunchale, were a breeding male was taken April 26 (Sutton).

Centurus santacruzi grateloupensis (Lesson). Santacruz Woodpecker. Fairly common among larger trees along the Moctezuma. A male taken by Burleigh at Tamazunchale, April 14, obviously represents the present subspecies for it is even paler throughout the underparts than spring specimens from Cordoba, Veracruz.

Scapaneus guatemalensis regius (Reichenbach). Veracruz Ivory-billed Woodpecker. Fairly common in heavier woodlands. Our only specimen, a breeding male, taken by Semple along the Moctezuma four miles upstream from Tamazunchale, is of the present race, the wing measuring 202 mm.

Veniliornis oleaginus oleaginus (Lichtenstein). Oleaginous Woodpecker. Noted only in deeper woodlands along the Axtla River, where a breeding male was taken March 26 (Sutton) and two birds were observed April 25. The wing of our specimen measures 101.5 mm., the tail 54.

Xiphorhynchus flavigaster flavigaster Swainson. Ivory-billed Woodhewer. Fairly common in brushy as well as heavier woodlands, breeding specimens being taken April 20–27.

Platypsaris aglaiae gravis van Rossem. Northern Rose-throated Becard. Seen daily, mated pairs being noted from April 17 to the end of our stay. Three nests found, each of them roughly spherical, made of twigs, and suspended from the tip of a swaying branch. The first of these, found by Semple on April 17, was fifty feet or more from the ground, at the very tip of a supple bough that whipped back and forth in the wind. Here the birds went on with their building work, heedless of the commotion. Our two specimens measure: male, wing, 93.5 mm., tail, 70; female, wing, 96.5, tail 73.

Tityra semifasciata personata Jardine and Selby. Mexican Tityra. Fairly common, especially along the Moctezuma River upstream from Tamazunchale, where sparring males or mated pairs were observed repeatedly. Pairs seen at or near deserted woodpecker holes, April 14 to 20, were thought to be nest-hunting. A female that was laying or brooding eggs was frightened from such a hole April 25.

The naked space about the eyes in freshly collected specimens was raspberry red, much brighter in males than in females.

Thamnophilus doliatus mexicanus Allen. Mexican Ant Shrike. Fairly common in brushy woodlands, especially about Jalpilla and Matlapa. At the latter place a female with fully formed egg in the oviduct was taken April 24 (Sutton).

Griscom, in his "Distribution of Bird-Life in Guatemala" (*Bull. Amer. Mus. Nat. Hist.*, **64**, 1932: 233), characterizes *Thamnophilus doliatus intermedius* Ridgway as "a variable bird," ranging from "southern Mexico to western Panama on Caribbean slope, and Pacific coast of Guatemala," apparently expecting us to believe that San Luis Potosí and "Pacific coast of Guatemala" birds are the same. With this concept we cannot concur, since our Tamazunchale (and Valles) specimens are very long-tailed by comparison with *intermedius* from Guatemala and Honduras. It appears from a careful examination of all pertinent material in the U. S. National Museum, the American Museum of Natural History, and the Museum of Comparative Zoology, that J. A. Allen, in bestowing the name *mexicanus* upon Cabanis' and Heine's "*Thamnophilus affinis*" (from Jalapa, Veracruz) was actually naming an intermediate race. Insofar as Jalapa, Veracruz birds themselves are concerned, therefore, *T. d. mexicanus* Allen might stand as a synonym of *T. d. intermedius*, but since Jalapa birds *tend* to be longer-tailed than those from Honduras it seems eminently sensible to use the name *mexicanus* for long-tailed, northward-ranging birds (such as those collected by us in San Luis Potosí) rather than to complicate matters further by finding an entirely new name for them.

The tail in ten Guatemala male *intermedius* selected at random from the M.C.Z. collection measures: 60, 58, 66, 61, 65, 66, 66, 62, 60, and 64 mm.; in ten Honduras male *intermedius:* 63, 64, 64, 65, 63, 63, 63, 65, 62, and 64; in San Luis Potosí male *mexicanus* at hand; 72, 72.5 and 72.

Tyrannus melancholicus couchii Baird. Couch's Kingbird. Common in opener country, especially along the Moctezuma River not far from Tamazunchale. The gonads of a male and a female specimen taken April 16 were somewhat enlarged.

Legatus leucophaius variegatus (Sclater). Greater Striped Flycatcher. Fairly common along the edges of woodlands. Breeding males taken March 26 and April 15. The wing in these measures 91 and 96 mm., clearly indicating this larger race.

Myiodynastes luteiventris luteiventris Sclater. Sulphur-bellied Flycatcher. Fairly common along the rivers, nesting pairs being encountered daily. Our two specimens (female, April 14; male, April 20) agree with birds from more southern parts of Mexico in being warmly toned on the back, but *swarthi* (described from Arizona) appears to be a not very strongly marked race.

Megarynchus pitangua (Linnaeus). Boat-billed Flycatcher. Fairly common. April 15 a pair were discovered at a woodland pool not far from Tamazunchale. Their nest, which was very bulky, was placed in an exposed position in the top of a leafless tree that stood in the water (Burleigh).

Myiozetetes similis texensis (Giraud). Giraud's Flycatcher. Fairly common, breeding pairs being encountered daily throughout our stay. April 14 birds with nesting material in their bills were seen. April 21, near Jalpilla, a nest was found among the leaves of an air plant on a horizontal branch twenty feet from the ground. The nest, being composed of dry grasses, was plainly discernible, the more so because the noisy and demonstrative owners remained so close to it (Sutton).

Pitangus sulphuratus (Linnaeus). Derby Flycatcher. Common, nesting pairs being seen daily.

Myiarchus cinerascens (Lawrence). Ash-throated Flycatcher. Three seen near Jalpilla, April 18.

Myiochanes richardsonii (Swainson). Western Wood Pewee. Noted twice, a single bird April 23 and a single bird April 24, along the Axtla River. The call-note was clearly that of the western rather than of the eastern species.

Empidonax minimus (Baird). Least Flycatcher. Identified with certainty but once, a single bird that gave its "che-bec" call-note several times, April 27, along the Axtla River, twenty miles north of Tamazunchale.

Empidonax sp. From April 14 to 18 the absence of small flycatchers of this genus was notable. On the latter date several were seen, and between then and April 23 a migratory wave passed through. No specimen collected.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher. Single bird seen April 23 on the outskirts of Tamazunchale.

Tachycineta thalassina (Swainson). Violet-green Swallow. Noted but once, a flock circling over the Moctezuma River near Tamazunchale, April 16.

Stelgidopteryx ruficollis (Vieillot). Rough-winged Swallow. Noted but once, a mixed flock of Cliff Swallows and Rough-wings, seen not far from Tamazunchale along the Moctezuma, April 18.

Petrochelidon pyrrhonota (Vieillot). Cliff Swallow. Noted but once, April 18, as indicated above.

Progne chalybea chalybea (Gmelin). Gray-breasted Martin. A colony of twenty-some pairs nested about the bridge spanning the Axtla River twenty miles north of Tamazunchale. Here a male and female were taken April 21.

Psilorhinus morio (Wagler). Brown Jay. Fairly common. A nest found April 22 was broad and flat, and situated about fifteen feet from the ground among the bare lower branches of a large tree. The parent bird, presumably the female, was brooding (Semple). April 25, a partly finished nest was found not far from the Axtla River, again on a leafless branch in a shaded part of the forest, about twenty feet from the ground (Sutton).

Xanthoura luxuosa luxuosa (Lesson). Green Jay. Common. Our only specimen (male, Axtla River, April 25) measures: wing, 118 mm., tail 138.

Parus atricristatus atricristatus Cassin. Black-crested Titmouse. Fairly common in opener woodlands. The wing of our only specimen (female, April 15, Burleigh) measures 67 mm.

Cistothorus platensis stellaris (Naumann). Short-billed Marsh Wren. Noted but once, a company of scolding and singing birds in a marshy spot near Matlapa, April 18. From these a male with slightly enlarged testes was taken. Though in the midst of an extensive prenuptial molt, this bird was singing with fervor (Sutton).[5]

Thryothorus maculipectus microstictus (Griscom). Northern Spotted-breasted Wren. Fairly common, male and female specimens being taken April 14 to 23. On April 23 a partly completed nest was discovered near Tamazunchale (Sutton).

Troglodytes domesticus Wilson. House Wren. Noted infrequently April 14 to 21. No specimen taken.

Henicorhina leucosticta prostheleuca (Sclater). Sclater's Wood Wren. Fairly common, being found as a rule in less brushy woodlands than those favored by *Thryothorus maculipectus*, though the two species were occasionally encountered side by side. Breeding males taken near Tamazunchale April 23 to 27.

Toxostoma longirostre (Lafresnaye). Long-billed Thrasher. Seen repeatedly in brushy woodlands. No specimen collected.

Dumetella carolinensis (Linnaeus). Catbird. Noted repeatedly April 15 to 22. Not so common thereafter, but recorded infrequently until April 28. Female taken at Jalpilla, April 19 (Semple).

Turdus grayi Bonaparte. Gray's Robin. Fairly common in big trees along the

[5] See note in *Auk*, 57, July, 1940: 419.

outskirts of Tamazunchale, singing males being heard from April 15 to the end of our stay.

Hylocichla ustulata (Nuttall). Spruce-woods Thrush.[6] Thrushes of this species were seen and heard singing frequently April 18 to 28, but no specimen was taken.

Catharus aurantiirostris melpomene (Cabanis). Nightingale Thrush. Noted but once, a male taken in a densely thicketed ravine near the Axtla River, April 22 (Sutton). This specimen was molting about the face and throat. The testes were only slightly enlarged. The breeding ground of this form is said to be the "highlands" of southern Mexico, so the valley of the Axtla is probably part of its winter range.

Polioptila sp. Gnatcatchers were seen from time to time in brushy woodlands in the immediate vicinity of Tamazunchale, but no specimen was collected.

Bombycilla cedrorum Vieillot. Cedar Waxwing. Several large flocks seen along the Axtla River, April 19.

Vireo griseus micrus Nelson. Small White-eyed Vireo. White-eyed Vireos were noted repeatedly in brushy woodlands, especially in the vicinity of Jalpilla and Matlapa. A mated pair taken at the former place April 19 are referable to the present race (wings in both specimens 55 mm.) though the fact that they are definitely yellower below and greener (less gray) above than February *micrus* from Nuevo Leon suggests that they may be somewhat intermediate between *micrus* and *perquisitor* Nelson, the latter a little known form described from Palantla, Veracruz.

Vireo solitarius (Wilson). Blue-headed Vireo. Noted daily April 14 to 22. No specimen taken.

Vireo virescens flavoviridis (Cassin). Yellow-green Vireo. Noted daily in woodlands of all sorts. Everything about the bird (its song, manner, and habitat) suggested the common Red-eyed Vireo of the eastern United States. Male and female specimens taken April 14 to 22.

Cyclarhis gujanensis flaviventris Lafresnaye. Mexican Pepper Shrike. This sweet-voiced bird was fairly common in brushy woodlands. A female taken by Semple, seven miles south of Tamazunchale, April 28, was laying eggs. Eyes of all individuals closely observed were brick red.

Mniotilta varia (Linnaeus). Black and White Warbler. Seen daily April 14 to 24, a female being collected on April 16 (Burleigh).

Vermivora celata (Say). Orange-crowned Warbler. Several noted April 16, not far from Tamazunchale. Not satisfactorily identified otherwise.

Vermivora ruficapilla (Wilson). Nashville Warbler. Noted several times April 18 to 21.

Compsothlypis pitiayumi (Vieillot). Pitiayumi Warbler.[7] Several seen along the Axtla River, April 22. No specimen taken.

Dendroica virens virens (Gmelin). Black-throated Green Warbler. Noted repeatedly April 14 to 22. Male, molting slightly about head, taken April 14 (Burleigh).

Dendroica pensylvanica (Linnaeus). Chestnut-sided Warbler. Male seen in ravine seven miles south of Tamazunchale, April 26 (Sutton).

Seiurus noveboracensis (Gmelin). Northern Water-Thrush. Noted twice along the Axtla River, a single bird April 16, and a single bird April 18.

Seiurus aurocapillus (Linnaeus). Ovenbird. Two seen near Jalpilla, April 18.

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[6] Of the several common names suggested for this species, Spruce-woods Thrush seems to the senior author to be most apt and pleasing. "Buffy-faced Thrush" is descriptive but not euphonious. Many good names that might be given the bird would apply equally well to other species.—G.M.S.

[7] For *Compsothlypis p. pitiayumi* Hellmayr uses the common name 'Olive-backed Warbler' (Birds of the Americas, Pt. 8, 1935: 357). This, it seems to the senior author, is inadequate unless *C. americana* and *C. pitiayumi* are considered conspecific, for both groups are more or less 'olive-backed.' G.M.S.

Basileuterus culicivorus culicivorus (Lichtenstein). Lichtenstein's Warbler. Fairly common in heavier woodlands. One specimen taken, a male, April 27 (Semple).

Basileuterus rufifrons jouyi Ridgway. Jouy's Warbler. Noted infrequently in open and brushy woodlands. Breeding female and male taken respectively on April 25 and 28.

Geothlypis trichas (Linnaeus). Marsh Yellow-throat.[8] Noted infrequently April 14 to 22, a male being taken on the fourteenth (Burleigh). This specimen was molting extensively about the head, and we prefer not to attempt subspecific determination for the present.

Chamaethlypis poliocephala palpebralis Ridgway. Mirador Yellow-throat. Common locally in weed-grown fields, marshy spots, and along the grassy edges of open woodlands. Males and females taken April 15 to 21 were molting extensively about the head and chest. At Matlapa and Jalpilla, April 18 to 21, males were repeatedly noted singing flight songs and females seen building nests.

Icteria virens (Linnaeus). Yellow-breasted Chat. Several noted along the Axtla River and at Matlapa and Jalpilla, April 22 to 24.

Euthlypis lachrymosa lachrymosa (Bonaparte). Fan-tailed Warbler. Two breeding pairs encountered along wooded ravine seven miles south of Tamazunchale, April 26 to 28. A female taken there on the twenty-sixth was obviously preparing to nest (Sutton).

Wilsonia pusilla Wilson. Wilson's Warbler. A few noted daily April 14 to 19. No specimen taken.

Setophaga ruticilla (Linnaeus). American Redstart. Adult male seen near the Axtla River, April 21.

Icterus gularis (Wagler). Alta Mira Oriole. Abundant. Mated pairs noted repeatedly and several nests found. One of these (April 17) was suspended from a single telephone wire that hung high above a wooded ravine.

Icterus graduacauda graduacauda Lesson. Black-headed Oriole. Not common. A few noted March 27, on which date a male was taken. During April not certainly identified until the twenty-sixth, two mated pairs being seen at that time several miles south of Tamazunchale. Male taken April 28.

Icterus galbula (Linnaeus). Baltimore Oriole. Noted repeatedly April 15 to 19.

Icterus spurius (Linnaeus). Orchard Oriole. Noted several times April 15 to 19, a male being taken on the fifteenth (Burleigh). No indication of its breeding anywhere in the region.

Cassidix mexicanus prosopidicola Lowery. Mesquite Great-tailed Grackle. Common about farmlands and in open country. A breeding male, taken April 16, measures: wing, 198 mm.; tail, 202. A female (April 20) measures: wing, 144; tail, 146.

Dives dives dives (Lichtenstein). Sumichrast's Blackbird. Abundant and noticeable because of its incessant singing, especially in the heavy woodlands along the Axtla River. Breeding specimens taken March 26 and April 21 to 24.

Amblycercus holosericeus holosericeus (Lichtenstein). Prevost's Cacique. Noted first April 22, on a heavily thicketed hillside back from the Axtla River, and along a small stream near Palitla, two females being taken that day. Noted infrequently thereafter until April 28.

Tangavius aeneus aeneus (Wagler). Red-eyed Cowbird. Noted infrequently April 17 to 29. Female specimens, with enlarged ovary, taken April 21 and 23.

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[8] Satisfactory common names for such species as *Geothlypis trichas* are hard to decide upon. 'Yellow-throat' is not adequate because members of the genus *Chamaethlypis* also are 'Yellow-throats.' 'Witchety' would not be bad, if only someone had used it a century or so ago! Since *Geothlypis* is nearly always found about marshes, whereas *Chamaethlypis* often is found in dry fields, the common name Marsh Yellow-throat is offered here. G.M.S.

Piranga ludoviciana (Wilson). Western Tanager. Noted once, a male, along the Axtla River, April 22.

Piranga rubra (Linnaeus). Summer Tanager. Identified with certainty only on April 14, on which date three adult males were seen at Tamazunchale.

Tanagra lauta lauta Bangs and Penard. Bonaparte's Euphonia. Seen repeatedly in small companies or in pairs, April 14 to 20. Two males collected.

Tanagra affinis Lesson. Lesson's Euphonia. Identified with certainty only on April 14, when a male was collected (Sutton).

Thraupis abbas (Lichtenstein). Abbot Tanager. Fairly common, mated pairs being seen daily throughout our stay. A thin-walled nest, found April 25, was situated on a horizontal branch among some small air plants, about 25 feet from the ground, at the edge of an opening in the forest (Sutton).

Habia gutturalis littoralis (Nelson). Tabasco Ant Tanager. Fairly common in thicker woodlands along the Axtla River and near Palitla. Female specimens taken April 19 to 22 are referable to *littoralis* rather than *salvini*, for their throats are buffy ochraceous with an admixture of red rather than "ocher yellow or dull cadmium yellow" (see Ridgway, Birds of North and Middle America, Part 2, 1902: 148). Males taken during the same period compare favorably with either *littoralis* or *salvini*. Thus far we have not been able to discover any constant difference between adult males of these two races.

Rhodothraupis celaeno (Lichtenstein). Crimson-collared Grosbeak. A few were seen April 21 and 22, near the Axtla River, a male being taken on the latter day.

Richmondena cardinalis (Linnaeus). Cardinal. Noted only in brushy woodlands one to two miles north of Tamazunchale, two or three pairs being seen there each time we visited the place. No specimen taken.

Hedymeles ludovicianus (Linnaeus). Rose-breasted Grosbeak. Noted repeatedly April 14 to 29, never more than two or three a day, but in several sorts of woodland. Evidently a common transient or winter visitant.

Guiraca caerulea (Linnaeus). Blue Grosbeak. Noted several times April 21 to 28, in the vicinity of Jalpilla, Matlapa, and Palitla. No specimen taken.

Cyanocompsa parellina parellina (Bonaparte). Blue Bunting. The Blue Bunting presumably nests at Tamazunchale, but we did not procure a specimen that we knew to be breeding. A male and female taken in brushy woodland two miles north of town are too large-billed for *C. p. beneplacita* and, since the male is too dull a blue and the female too rufescent a brown (both above and below) for *C. p. lucida*, we are forced to conclude that they are straight *parellina*. Presumably this is the race that nests in the vicinity.

Cyanocompsa parellina lucida Sutton and Burleigh. Bright Blue Bunting. This recently described race must pass through the Tamazunchale section in migration. A subadult male (April 20) that is noticeably smaller-billed and brighter blue below than the male *parellina* referred to above, and a female (April 22) that is less rufescent brown both above and below than female *parellina* from Veracruz, both represent the present race.

Passerina cyanea (Linnaeus). Indigo Bunting. Noted daily April 14 to 21, especially in the vicinity of Jalpilla.

Passerina ciris (Linnaeus). Painted Bunting. Noted repeatedly April 16 to 24, at Jalpilla, Matlapa, and along the Axtla River.

Tiaris olivacea pusilla Swainson. Mexican Grassquit. Seen throughout our stay, notably April 15 and 16, when large flocks were encountered near Tamazunchale. Male with enlarged testes taken April 16 (Burleigh).

Saltator atriceps atriceps (Lesson). Black-headed Saltator. Common locally and very noticeable because of its noisiness. Especially abundant along the Axtla River, where it was always the first species to respond to our squeaking, from four to a dozen birds following us about wherever we went, scolding incessantly. Male and female specimens taken March 26 and April 19 to 28 exhibit

well the remarkable variation in extent and intensity of chest-band that is characteristic of this form.

Saltator coerulescens grandis (Lichtenstein). Lichtenstein's Saltator. Noted infrequently along the highway between Matlapa and the Axtla River. Male, with testes greatly enlarged, taken not far from the Axtla, April 19 (Sutton).

Sporophila torqueola morelleti (Bonaparte). Morellet's Seedeater. Fairly common in open country. A singing male, taken near Tamazunchale April 16, was molting about the face and throat (Sutton).

Volatinia jacarini splendens (Vieillot). Northern Blue-black Grassquit. Common in open pasturelands not far from Tamazunchale. Flocks of busily feeding birds seen repeatedly from April 23 to the end of our stay. The males indulged in astonishing antics which we assumed to be part of their courtship—quick, complete flip-flops made from dead twigs or from fence wires in the most adroit manner. Males, with testes greatly enlarged, taken April 23 (Sutton).

Arremonops rufivirgatus (Lawrence). Texas Sparrow. Common. Our two specimens (male, April 16; female, April 21) are too large-billed, and too dark both above and below for *A. r. rufivirgatus*. Since they are not big-billed enough nor dark enough on the chest and flanks for *A. r. crassirostris* (Ridgway), they must be called intermediates. The male measures: wing, 65 mm., tail 64; the female: wing, 61, tail, 59.

Allapetes brunnei-nucha brunnei-nucha (Lafresnaye). Chestnut-capped Atlapetes. Fairly common from four to nine miles up the Moctezuma River from Tamazunchale, on the lower slopes of the mountains. Breeding specimens taken there April 14 to 27.

CORNELL UNIVERSITY, ITHACA, NEW YORK.

ORNITHOLOGICAL NEWS

The Minnesota Ornithologists' Union issued a special number of its official publication, *The Flicker*, in commemoration of the 1940 Wilson Ornithological Club meeting in Minneapolis. An illustration and description of the attractive Calder statue of Alexander Wilson in Philadelphia, an annotated list of the birds named by and for Wilson, and a paper on the different editions of Wilson's American Ornithology make the issue of special interest to collectors of Wilsoniana. In addition there is an historical sketch of the Minnesota Ornithologists' Union and a summary of 1940 Minnesota nesting records. We understand that the editor, Arnold Erickson of the University of Minnesota, University Farm, St. Paul, has a few extra copies of this issue which may be obtained at twenty-five cents each.

By a recent Act of Congress the Barro Colorado Island Biological Laboratory has been put on a permanent basis with government financial support. The island has been set aside as a wildlife reserve under the name of the "Canal Zone Biological Area" and will be administered by a Board made up of three Cabinet officers, the Secretary of the Smithsonian Institution, the president of the National Academy of Science, and three "distinguished biologists." The three biologists on the present board include two ornithologists, Thomas Barbour and Alexander Wetmore.

On December 20 the American Geographical Society presented the Cullum Geographical Medal for 1940 to Robert Cushman Murphy.

Guy Emerson has been elected President of the National Audubon Society (formerly known as the National Association of Audubon Societies).

Frederick H. Test is now Instructor in the University of Michigan Department of Zoology.

DISTRIBUTION AND CHARACTERS OF THE UTAH RED-WING

BY WILLIAM H. BEHLE

IN 1938 Louis B. Bishop described a new race of Red-wing from Utah. The type and cotype, a male and female, were taken on April 21, 1921 near Saltair, 4200 ft., Salt Lake County, Utah. Saltair is a resort and bathing pavilion on the shore of Great Salt Lake and lies some 18 miles due west of the business district of Salt Lake City. The new race was named *Agelaius phoeniceus utahensis*. No statement of range was given by the describer, although specimens that indicate the general extent of the race are listed in an accompanying table of measurements. Breeding specimens represented in his materials from Utah were taken at Saltair, the Bear River Marshes (Boxelder County) and in Garfield and Beaver counties (localities not given). Records from outside the state (non-breeding birds) were from Portal and Prescott, Arizona, and Newcastle, Colorado. Comparative measurements were given for the *utahensis* representatives, as well as for a few specimens of the surrounding races, *nevadensis, fortis* and *sonoriensis*.

There have accumulated in recent years in the Museum of Zoology at the University of Utah some 170 study skins of the Red-wing from various parts of the state. Of these, 93 are adult breeding specimens. Through the courtesy of Dr. Alden H. Miller of the California Museum of Vertebrate Zoology I have had available for comparison 38 breeding examples from southern Idaho, as well as a small series of 12 topotypes of the race *nevadensis*. Based on a study of these materials, the ensuing comments are intended as supplementary data in presenting the picture of the distribution and variation of the Utah race of Redwing.

The geographically variable features in connection with this new race concern several characters, namely, the increased red pigmentation of certain body areas, the width of the darker centers of the breast feathers of females, the size and length of bill, and the length of wing and tail. In general, this new race shows intermediate features between surrounding races, but one character (an increase in red pigmentation) seems to be more or less distinctive of this race alone.

Bishop (1938) mentioned that his females from Saltair were conspicuous in having a wash of color on the throat area that tended toward pale flesh color or salmon pink. I find this character to be of high incidence, being found in practically all of the specimens examined, and those few that lack it may be first year birds. Apparently correlated with the throat-wash character is an increased reddish coloration on the bend of the wing of females. Females from the sloughs and marshes

east of the Great Salt Lake seem to possess the greatest amount of red pigmentation both on the throat and bend of wing areas, but the great majority of the female specimens from the Snake River region of southern Idaho also possess these characters, as do birds throughout northern Utah. Females from southeastern Utah and beyond into Arizona are likewise characterized by this increased red. However, certain specimens in the southwestern part of Utah seem to lack the intense red. In practically all of the male examples of *utahensis* seen, the epaulets of the shoulder region are more richly colored than in specimens of other races. The red is more of a scarlet tone and so is different from the orange red of other races.

There are interesting points of contrast between areas of intergradation with respect to this intense red pigmentation character of both males and females. In northeastern Utah and southeastern Idaho where on the basis of size characters the population appears to be somewhat intermediate between *utahensis* and *fortis*, the increased red pigmentation is present. In southwestern Idaho and northwestern Utah where the tendencies are toward *nevadensis*, as indicated by bill characters, the color remains that of *utahensis*. In contrast to these cases, in extreme southwestern Utah breeding males in a few instances show epaulets that are more of an orange red as in the race *nevadensis*, while most of the females lack the reddish wash on the throat and breast and are less highly colored on the bend of wing. Size characters, especially of bill, in specimens from this area are those of *utahensis*. This time the color characteristics indicate the beginning of an intergradational trend.

There are, of course, no distinctive racial characteristics in males with respect to the black plumage areas. In females, though, there are features that show an intermediate condition as between neighboring races. Compared with *fortis*, *utahensis* specimens have the central brown portion of the breast feathers not as heavy or wide. The result is that the intervening light areas are more extensive, thus giving a general lighter appearance. In comparing *utahensis* and *sonoriensis*, the central dark areas in *utahensis* are wider than those in the more southern race. This is in keeping with a general trend of paleness toward the south.

In bill characters *utahensis* shows an intermediate condition between *fortis* and *nevadensis*, being smaller and shorter than *fortis* but with something of the heaviness of bill of that race. The *utahensis* representatives do not have the long, attenuated appearance to the bill characteristic of specimens of *nevadensis*. They appear to be shorter, slightly deeper at the base, and more abruptly pointed. Curiously, though, the measurements accompanying this paper do not show any appreciable differences between the races in these respects. The distinction, however, is apparent when typical specimens of each race are compared. The birds with most typical bills representing *utahensis* are

those from Salt Lake City and vicinity and from Moab and vicinity. It seems that the bills of the birds from the Snake River region of southern Idaho are the most variable of any series studied. This represents the periphery of the range of *utahensis* where the influence of *nevadensis* is felt. Thus it would seem that there is greater variability where two genetic strains intermingle than elsewhere.

In wing length I have found practically no difference between *nevadensis* and *utahensis*, nor does there seem to be any geographic variation within the race *utahensis* with respect to this character. The race *fortis* has a conspicuously longer wing than *utahensis* and where *utahensis* intergrades with *fortis* increased length of wing is apparent. Specimens north and northeast of the Bear Lake area indicate this. Length of tail varies with wing length.

To summarize all of this variation, it seems that the race *utahensis* has a center (which may or may not be the center of differentiation) where breeding birds are the most typical and show the most diagnostic characters. The type locality is, fortunately, in this center, which is the area in central northern Utah, east of Great Salt Lake. Birds from this section have heavy, deep, but relatively short bills and intense red pigmentation. Radiating out from this center there is to the southwest a trend toward paleness of the underparts of females and a tendency for the intense red pigmentation to fade out. This starts in extreme southwestern Utah. The bill characteristics in this area remain typical of *utahensis*, however. These changes indicate intergradation, probably with *nevadensis*. To the north and northeast of the center mentioned above, extending into southeastern Idaho and western Montana, the trend is toward larger size. Birds from the vicinity of Bear Lake indicate the beginning of this trend toward *fortis*, yet they retain the coloration of *utahensis*. Extending north and northwest from the center previously mentioned, the trend is toward *nevadensis*, for in the Snake River region of southern Idaho the birds have bill characters that are more those of *nevadensis*, but again the coloration is that of *utahensis*.

From his studies on Red-wings, van Rossem (1926) conceived of different ancestral stocks. One of these, that has presumably invaded the western United States from the southeast, forms a chain of races from *megapotamus* of the Rio Grande valley through *sonoriensis* and *nevadensis* to *caurinus* of the northwest humid coast belt. The features in common among these races are the slender type of bill, streaked females, and the middle wing coverts of adult males of a clear buff on their exposed portions. A second strain, characterized by heavy bill, streaked females, and males also of the buff-winged type, has presumably pushed northward from southern Mexico with one branch extending into California and represented by *neutralis*, the other an extension north to become *fortis*. The race in the eastern part of the Great Basin, namely, *utahensis*, seems not to belong to the slender-

billed strain but rather has closer affinities with the thick-billed strain. This indicates, perhaps, a pushing in from the northeast and a derivation from the thick-billed *fortis* stock.

While it seems that *utahensis* blends with *fortis* in southeastern Idaho and probably Wyoming, it probably intergrades with *nevadensis*

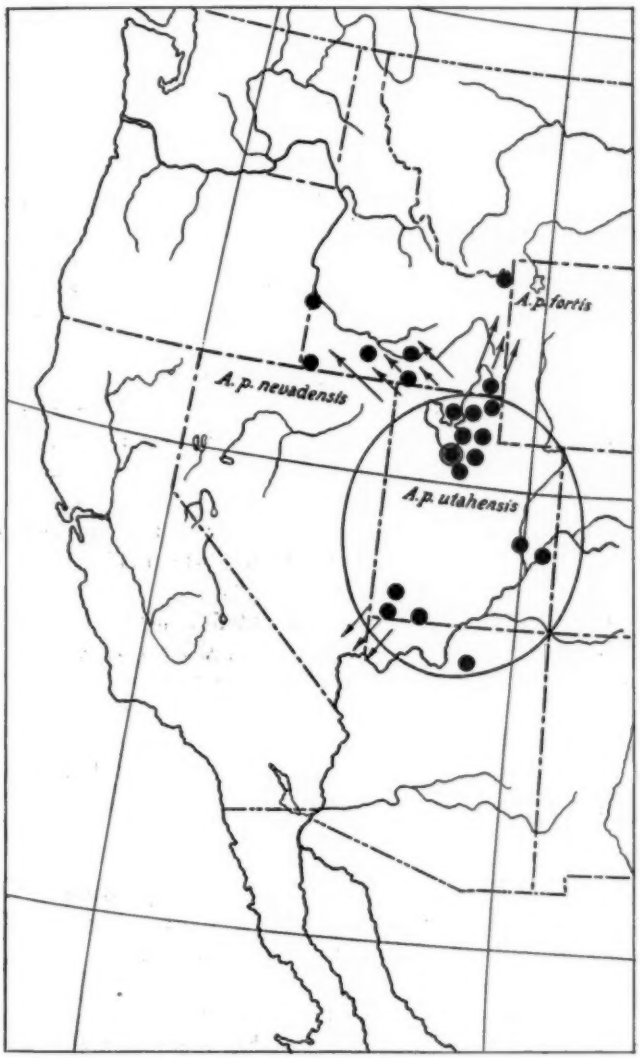

Figure 1. The breeding range of *Agelaius phoeniceus utahensis*. Solid dots indicate localities from which breeding specimens have been collected. Encircled dot designates type locality. Intergradational trends are indicated by arrows.

to the south. The A.O.U. Check-list indicates that *nevadensis* extends across Arizona, except for the extreme southern portion, into New Mexico and western Texas. If this is the case, there is all the more reason to regard *utahensis* as a southward or southwestward extension from *fortis* after that strain had pushed north farther east. There is the alternative explanation that in the gradual shifting of these stocks spacially throughout time, that the *nevadensis* stock pushed into Arizona, New Mexico and Texas, and replaced a thick-billed form from that area. However, this hypothesis seems less tenable than the other.

Bishop (1938) calls attention to the fact that Red-wings wander widely, winter in great flocks, and that individuals of one race may become "lost" and travel with flocks of another race to their breeding grounds. To illustrate this he cites a few examples, one of which concerns a male specimen of *nevadensis* collected in a breeding colony of *utahensis* on the Bear River Marshes, June 23, 1930. In such cases one is always confronted with the question of whether such lone individuals are truly strays of a neighboring race or whether they represent extreme variants of the local race. In such a genus as *Agelaius* which shows much individual variation as well as great geographic variation, I am inclined toward the latter view.

There is the possibility that the type specimen of *sonoriensis* was a winter-taken migrant from the range of *utahensis*. Van Rossem (1926:227) stated that the type was a young female in first winter plumage taken February 10, 1867. No type specimen was indicated by Ridgway in his original description of *sonoriensis*, but the type was later designated as from Camp Grant, Arizona, which is located some 60 miles east of Tucson, Arizona. This locality is east of the breeding range of *sonoriensis* and in a region frequented in winter by both *fortis* and *nevadensis*, and as Bishop has indicated, also by *utahensis*. Quoting from van Rossem: "In color, the type is not quite like the average from the metropolis of the race and its bill is shorter than any other female *sonoriensis* so far examined. It recalls certain young females of *fortis* in some particulars and its identity may yet be shown to lie in that direction." In the absence of further material, van Rossem applied the name *sonoriensis* to the race inhabiting the Lower Colorado River Valley and the coastal districts of Sonora and Sinaloa. Bishop, when about to name the Utah race, was troubled with the problem of whether the type of *sonoriensis* might possibly have been a winter-taken migrant from the range of *utahensis*. He corresponded with and sent specimens to Dr. Oberholser and Dr. Wetmore, who were in a position to examine the type. It is now the feeling of all concerned, that the type of *sonoriensis* should be regarded as correct; that it is essentially like birds breeding in the lower Colorado River Valley and south to Mazatlan; that in any event nothing would be gained by attempting to discredit the type. To do so would lead to nomenclatural confusion.

TABLE 1

MEASUREMENTS IN MILLIMETERS OF ADULT BREEDING RED-WINGS

		Wing	Tail	Exposed culmen	Depth bill at base	Tarsus
5♂♂	Quinn River Crossings, Humboldt Co., Nevada (topotypes *nevadensis*)	124.8(124.0-128.6)	91.5(90.0- 95.4)	22.8(21.3-24.2)	11.2(10.7-12.3)	30.4(29.0-31.5)
6♂♂	Riddle, Owyhee Co., Idaho (intergrades)	124.1(121.0-128.5)	91.9(89.4- 96.4)	23.5(20.0-25.2)	11.5(11.0-12.1)	28.7(26.4-30.4)
4♂♂	Payette, Payette Co., and Homedale, Owyhee Co., Ida. (intergrades)	128.2(126.0-134.0)	96.9(94.0-100.0)	22.3(21.8-23.0)	11.4(11.0-12.3)	30.2(28.9-32.6)
9♂♂	Rupert and vicinity, Minidoka Co., Idaho (intergrades)	125.0(120.7-128.6)	93.8(89.0- 98.6)	21.9(21.3-24.3)	10.2(9.8-10.4)	29.3(26.6-30.0)
2♂♂	Bear Lake and vicinity, Bear Lake Co., Idaho (intergrades)	124.6(123.5-125.8)	91.4(90.5- 92.4)	20.5(20.0-21.0)	11.6(11.5-11.7)	29.7(29.4-30.1)
12♂♂	Bountiful and vicinity, Davis Co., Utah (*utahensis*)	126.2(123.6-129.0)	93.0(87.5- 95.4)	21.3(20.3-22.3)	11.3(10.5-12.3)	29.5(28.5-30.4)
13♂♂	Salt Lake City and vicinity, Utah (*utahensis*)	124.3(118.0-128.7)	93.7(88.7-106.0)	21.1(19.7-25.4)	11.3(10.7-11.8)	29.5(26.8-31.7)
7♂♂	Pine Valley and vicinity, Washington Co., Utah (*utahensis*)	123.7(122.2-126.4)	91.9(90.0- 93.6)	21.7(20.3-22.7)	10.8(10.0-11.7)	29.2(27.9-29.9)
7♂♂	St. George and vicinity, Washington Co., Utah (*utahensis*)	125.6(123.0-129.7)	93.3(89.3- 97.8)	21.4(20.0-23.0)	10.6(10.0-11.1)	28.8(27.1-29.4)
2♂♂	Green River, Emery Co., Utah (*utahensis*)	126.1(125.7-126.6)	90.2(88.9- 91.5)	22.4(22.2-22.7)	10.8(10.7-11.0)	30.2(28.9-31.6)
22♂♂	Moab and vicinity, San Juan Co., Utah (*utahensis*)	126.6(121.0-132.0)	93.4(86.7- 97.8)	20.4(18.0-24.0)	10.9(10.6-11.6)	30.0(27.6-32.5)
6♀♀	Quinn River Crossing, Humboldt Co., Nevada (topotypes *nevadensis*)	101.2(97.6-104.6)	73.5(70.2- 76.4)	18.3(18.0-19.1)	9.1(8.6- 9.6)	26.2(25.1-27.0)
4♀♀	Riddle, Owyhee Co., Idaho (intergrades)	99.9(98.8-101.4)	70.6(68.7- 73.8)	18.5(18.0-19.6)	9.4(8.5-10.1)	25.5(24.7-26.0)
4♀♀	Payette, Payette Co., and Homedale, Owyhee Co., Ida. (intergrades)	104.5(99.4-108.2)	76.1(71.0- 78.4)	18.9(18.4-19.8)	9.1(9.0- 9.5)	26.4(25.8-26.8)
7♀♀	Rupert and vicinity, Minidoka Co., Idaho (intergrades)	105.4(104.0-108.4)	76.6(73.2- 79.0)	18.5(17.2-19.5)	9.2(9.0- 9.7)	26.1(24.0-27.4)
3♀♀	Bountiful and vicinitv, Davis Co., Utah (*utahensis*)	106.8(104.4-109.7)	80.3(79.6- 81.7)	17.1(17.0-17.3)	9.3(9.5- 9.1)	27.1(25.9-28.4)
3♀♀	Salt Lake City and vicinity, Utah (*utahensis*)	106.9(104.8-109.0)	78.6(76.5- 81.5)	17.4(17.0-17.6)	9.0(8.7- 9.2)	26.1(25.7-26.8)
3♀♀	Pine Valley, Washington Co., Utah (*utahensis*)	98.9(97.5-101.7)	72.8(69.1- 74.9)	17.7(17.5-17.9)	8.8(8.4- 9.3)	26.7(26.0-27.5)
7♀♀	St. George and vicinity, Washington Co., Utah (*utahensis*)	101.2(99.5-104.2)	74.7(71.3- 79.4)	17.9(17.1-18.7)	9.1(8.8- 9.3)	23.9(25.0-28.2)
7♀♀	Green River, Emery Co., Utah (*utahensis*)	102.8(100.9-104.0)	75.1(70.6- 77.6)	18.0(16.7-19.2)	9.8(8.8-11.0)	26.0(24.4-26.6)
6♀♀	Moab and vicinity, San Juan Co., Utah (*utahensis*)	104.6(102.0-106.0)	76.0(72.5- 78.8)	17.1(16.0-18.2)	9.2(8.5- 9.8)	26.1(25.6-26.7)

SPECIMENS OF *Agelaius phoeniceus utahensis* EXAMINED: Breeding specimens are indicated by an asterisk. Specimens listed from Idaho are in the California Museum of Vertebrate Zoology, with one exception as indicated. These are intergrades. All those listed from Utah are in the Museum of Zoology, University of Utah. The number of specimens from each locality is also indicated. Total number, 206.

IDAHO: *Payette County*: 2 mi. S Payette*, 1. *Owyhee County*: Homedale*, 10; 1 mi. S Riddle, 5300 ft.*, 7. *Gooding County*: 2 mi. E Hagerman*, 3. *Minidoka County*: 2 mi. E Acequia*, 8; 4 mi. E Rupert, 4. *Cassia County*: Elba*, 4. *Bear Lake County*: Paris*, 3 (Mus. Zool. Univ. Utah).

UTAH: *Rich County*: Laketown*, 1; Woodruff, 4. *Morgan County*: Morgan*, 1. *Cache County*: Logan, 3. *Boxelder County*: Bear River Migratory Bird Refuge, 2. *Davis County*: Kaysville*, 2; Bountiful*, 13; Rudy Duck Club*, 4; Antelope Island, Great Salt Lake*, 2. *Salt Lake County*: Salt Lake City*, 26; Magna, 2; Riverton*, 6. *Utah County*: Jordan River near Camp Williams, 2; 7 mi .W. Spanish Fork*, 2. *Washington County*: Pinto, 6500 ft.*, 2; Pine Valley, 6700 ft.*, 8; St. George, 2800 ft.*, 20; Hurricane*, 9; Zion National Park*, 2. *Carbon County*: Wellington, 10. *Emery County*: Green River*, 10. *Grand County*: Moab, 4000 ft.*, 32; Castle Valley, 15 mi. E Moab*, 3.

ARIZONA: *Coconino County*: Tuba City, 5200 ft.*, 1. (Mus. Zool. Univ. Utah).

LITERATURE CITED

BISHOP, LOUIS B.

1938 An Apparently Unrecognized Race of Redwing from Utah. *Trans. San Diego Soc. Nat. Hist.*, 9, No. 1, Nov. 21, 1938:1–4.

VAN ROSSEM, A. J.

1926 The California Forms of Agelaius phoeniceus (Linnaeus). *Condor*, 28, No. 5, Sept.-Oct., 1926:215–30. figs. 72:76.

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NESTING PIGEON HAWKS

BY JOHN AND FRANK CRAIGHEAD

EVER since we first saw Pigeon Hawks[1] passing over Cape May, New Jersey, on their southward migration, we had hoped some day to study and to photograph their nesting habits. When we learned from Captain R. L. Meredith that the species nests in the "Border Lakes" region of Minnesota and Ontario, the possibility of realizing our ambition seemed within reach. In the summer of 1935, with the Pigeon Hawk nesting grounds as our objective, we traveled north 40 miles from Grand Marais, Minnesota, to Gunflint Lake.

The Pigeon Hawk country is a land of heavy timber interspersed with numerous lakes and bare, burned-over, open areas of glacier-scarred, metamorphic rocks. Spruce, birch, and tamarack grew in the low, swampy areas bordering the lakes. Jack pine, aspen, and birch occupied the higher ground and ridges, while the numerous islands were clothed with heavy, mixed stands of white pine, spruce, balsam, and a few old scattered jack pines. Bare rocks, large burned-over tracts, and numerous lakes formed the open areas; it was the type of country in which one would expect to find Sharp-shinned Hawks and Goshawks rather than falcons. Goshawks, Ruffed Grouse, and Spruce Grouse were abundant in the heavy forest, while the Common Loon, the Goldeneye, and the American Merganser nested on the small islands in the lakes.

Locating Nests

Although the country was new and strange to us, we had no difficulty in locating the first Pigeon Hawk nest. Far out across Gunflint Lake, we heard one of the birds calling. Thus guided, we paddled to the end of a long peninsula and there 35 feet above the ground in the top of a spruce tree was a nest containing four young falcons about six days old (July 5).

We located seven nests between July 5 and July 9. Five were disclosed by the calls and excited behavior of the birds when we were in the general vicinity of their nest. The birds called from conspicuous perches and were often heard and seen from a quarter to a half mile across the water. Two nests were discovered by climbing the trees to inspect stick structures. At these sites neither parent birds were seen for several hours, but when they did return, they screamed and dove at us just as the hawks had done at the other nests. Presumably they had been hunting at too great a distance to detect our presence when we first arrived. All the nests were from 35 to 60 feet above the ground and with one exception were located

[1] *Falco columbarius.*

in the very tops of the trees. The rather bulky nests were constructed of large twigs, lined in most cases with very small twigs and coniferous needles. One nest was lined with cedar bark and contained deer hair. Nests were at least 2 miles apart, distributed over a large area, and all were located near water.

Figure 1. Typical Pigeon Hawk country. Nest No. 5 was located on the small island at the right.

Photographic Technique

At only two nests was it at all possible to take photographs. Even these were so situated that we could not build a tree blind but were forced to release our still and movie cameras by remote control from a blind on the ground. Glasses were used to keep watch on the nest. The cameras were fastened to the swaying tree tops by angle irons and ball and socket joints. The slender tree tops bent under our weight and in order to have the cameras sighted properly after we had descended and the tip of the tree had straightened up, it was necessary to sight and focus below the nest. In spite of this precaution, the swaying of the trees caused several pictures to show only half a hawk and half a nest. The blind was constructed of shelter-tent halves and dyed mosquito netting. The netting and a fly spray were a most important part of the equipment to protect us at least partially from the hordes of mosquitoes that beset us day and night. It was necessary to climb the tree after every feeding, wind the movie camera and reload the still cameras. Fortunately

this did not seem to disturb the hunting and feeding routine of the hawks too much, or to cause undue alarm or suspicion. It was not the hawks that caused our greatest photographic difficulty, but the very poor and often-changing light conditions. It was necessary to make many exposures in order to obtain a few good pictures.

Figure 2. Female Pigeon Hawk at the nest.

Behavior at the Nest

While the blind was being built and the cameras were being placed in a nearby tree, both birds attacked us, striking repeatedly and scolding fiercely. The protesting call of the Pigeon Hawk is very much like the *killi, killi* cry of the Sparrow Hawk (*Falco sparverius*) but much shriller and repeated so rapidly that it ends with a piercing *ki-ki-ki-ki-kieeee* or a gutteral *kac, kac, kac* when the hawk is exceptionally frightened or excited. Once heard it can hardly be mistaken. The female was especially aggressive, but the male soon retired and by the time we were ready to crawl into the blind he had left on a hunting excursion. Even after the photographic preparations had been completed the falcon continued to dive at the cameras, then returned to the nest to inspect the young. A little before sunset the male returned from across the lake with food. When he approached the island, the female left the nest, took the bird from him in the air and returned to feed the young ones. The next morning the male went hunting again while the female

kept guard from the top of a spruce tree. The male soon came in with a small bird. Before we could see him we heard his call from far out over the lake. The call was very similar to the long drawn out food cry of the Duck Hawk (*Falco peregrinus*) but higher pitched. He circled several times then transferred the bird to his beak. The

Figure 3. Young Pigeon Hawks being fed. The parent birds always plucked the prey before bringing it to the nest.

female did not fly out to take the food from the male as before, but remained perched on a limb. As the male flew past very close to her, she took the bird from him with her talons. After transferring the prey to his mate, the male left and before long returned with another bird. Instead of passing the food to the female as before, he went straight to the nest and fed the young. The click of our camera did not disturb him.

When the feeding was completed both birds went hunting. The female returned at intervals to inspect the young. The male paid a call late in the afternoon while the female was away. Finding everything in order he cruised off again and later returned with food which he fed to the young.

There were three feedings between 9:00 A.M. and 5:00 P.M.; the male brought all the food and fed the young twice. The female kept guard most of the day. If undisturbed both birds would probably have hunted.

On July 9 a blind was built at the other nest where photographing was possible. The cameras were set up, and two hours elapsed before

either bird appeared. Both were hunting, evidently at a great distance from the nest. The female returned without food, but later the male flew in with a bird and passed it to the female in the air. The next day when we climbed to the nest and set up our cameras both birds attacked us. The little male struck us repeatedly and drew blood on our heads and hands. He was exceptionally bold and did not hesitate to strike while flying at full speed. A strong wind and a cold rain made photographing difficult and hunting poor. The young hawks were fed only once.

TABLE 1

PIGEON HAWK NESTS

Nest No.	Date discovered	Location	Nesting Site: Tree	Height of Nest	Distance from water	Number of young: Male [1]	Female	Approximate age
1	July 5	Peninsula in Gunflint Lake, Minnesota	Spruce	35 ft.	100 ft.	2	2	6 or 7 days
2	July 5	Small island in Big Saganaga Lake, Minnesota	White pine	40 ft.	50 ft.	1 unhatched egg	2	6 or 7 days
3	July 6	Small island in Big Saganaga Lake, Minnesota	White pine	60 ft.	150 ft.	1	3	2 days
4	July 6	Northern Shore of Big Saganaga Lake, Ontario	White pine	40 ft.	300 ft.	0	1	4 or 5 days
5	July 7	Small island in Northern Light Lake, Ontario	White pine	50 ft.	200 ft.	2	3	14 days
6	July 7	Same as above	Jack pine	50 ft.	20 ft.	2	1	4 or 5 days
7	July 7	Southern edge of Saganagons Lake, Ontario				1	1	5 or 6 days

[1] By the time the young are 5 or 6 days old the sexes can generally be distinguished by weight and size of feet. The females have noticeably larger feet. The sex ratio indicated in the chart was determined by this method and later checked with the sex ratio of the young when full grown.

FEEDING OF THE YOUNG

The next day the wind blew the storm clouds away and swayed the slender tree that held our cameras. About noon the female returned with a Purple Martin (*Progne subis*). Having had only one meal the day before, the young hawks were extremely hungry, and

rushed for the food pulling and tugging at the prey. The old bird braced her feet on the edge of the nest, and a tug of war ensued. All four young pulled against the mother and got possession of the Martin, for in spite of their small size they were more than a match for her. Dodging back and forth across the nest, she attempted to regain the bird with which the young ones were eagerly but unsuccessfully struggling. Finally they quieted down, the falcon took possession of the prey, tore it into bits, and fed her hungry family. When the meal was almost completed one little hawk, not satisfied with her share seized the remains of the Martin and scurried to the far edge of the nest. She attempted to swallow the large morsel and almost succeeded when a sister pulled the food out of her mouth, turned her back on the first bird, spread her tiny wings, and took her turn trying to devour it. The mother falcon then left. Alone the young hawks struggled for the possession of the remains of their meal. Each one after snatching the food from his neighbor attempted to gulp it down. The remains of the Martin went the rounds; none could swallow it and all were too young to tear it up.

Between feedings the little falcons slept and occasionally preened their coats of down. Mosquitoes made life miserable for us in the blind and also attacked the young falcons. The mosquitoes bit their unprotected ears and even penetrated the down on their well covered backs and breasts.

In the afternoon the male returned twice with food; the young were fed once, and the female ate the second bird herself.

The parent falcons plucked all of the birds they brought to the nest as food for their young. Since we usually photographed or watched the process from a distance without interrupting it, only one food item (a Purple Martin) could be positively identified. We often saw the hawks chasing Purple Martins and Tree Swallows (*Iridoprocne bicolor*), and many small birds which appeared from a distance to be of these species were brought back to the nest.

W. J. Breckenridge has reported (*Auk*, 55, 1938: 669) similar feeding habits in the case of a pair of Pigeon Hawks with half-grown young which he studied "near Lake Saganaga" on the Minnesota side of the International Boundary in 1937. The prey consisted of small birds and dragonflies and the male "captured almost all of the prey."

Hunting Habits

From within the blind we saw the female Pigeon Hawk catch a large dragonfly and eat it while on the wing. The dragonfly, although very difficult for most birds to catch, appeared to be easy prey for the swift Pigeon Hawk. But how did these hawks catch birds? We had seen them vainly pursue Tree Swallows and Purple Martins. How could they catch them? One morning our question was answered. We saw a female Pigeon Hawk glide lazily above the lake and then

Figure 4. An immature male Pigeon Hawk from the Border Lakes region.

drift slowly over a large tract of burned-over land where only charred stubs stood high above the new, thickly-matted vegetation. When she reached this open, waste land, Tree Swallows suddenly appeared and darted at her as she spiraled lazily up and up. When so high in the sky that the swallows looked like tiny insects, the falcon turned over suddenly and dived earthward with the swallows chasing behind. As her speed increased she pulled away from the trailing swallows. When almost to the ground the Pigeon Hawk zoomed

upward and as she shot skyward the swallows that were flying behind also turned and shot skyward in front of her. She was now the pursuer and they the pursued. The greater weight of the hawk had so increased her downward speed that when she pitched up she mounted faster than the light swallows ahead of her. The swallows climbed upward in an attempt to escape, but the hawk mounted faster and deftly snagged a swallow as it seemed to hang motionless in the air. The rest milled about the hawk at a safe distance as she glided down over the lake and out of sight.

Behavior in Captivity

On July 12 we took several young hawks and left the mosquitoes and Pigeon Hawk country behind. The young birds developed into trim hawks. In order that we might learn more about their flying habits and ability, we trained them and flew them at various kinds of prey. The trained falcons easily caught Starlings, Blue Jays, Purple Grackles, and Bob-white. They could overtake pigeons but these were too heavy for the falcons to hold and after several unsuccessful flights they refused to chase them any more. The little males preferred smaller birds and were flown successfully at English Sparrows. Our Pigeon Hawks would often "bind" to their quarry after the manner of the short-winged hawks, but at other times they would "stoop" and strike down their prey like a Duck Hawk. When necessary they would even follow their prey into the woods.

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THE BREEDING WARBLERS OF THE CENTRAL ALLEGHENY MOUNTAIN REGION

BY MAURICE BROOKS

MOUNTAIN masses, and the interpretation of their plant and animal life, present a standing challenge to the biologist. The Appalachian mountain system, being of moderate elevation and located in mid-latitude regions, does not exhibit the striking contrasts to be found in high altitude mountains of more southern regions, where a climb of a few miles may take the observer from the tropical to the arctic-alpine; nevertheless our eastern ranges have been a haven of refuge for land forms since Palaeozoic times and have their fascinating problems of modern, as well as ancient, natural history.

The Area

The area with which this paper deals is centered roughly between the northern and southern extremities of the Appalachian system, and embraces the mountainous portion of western Maryland, all of West Virginia west of the Shenandoah valley, and portions of Frederick, Shenandoah, Rockingham, Augusta, Highland, Bath, Alleghany,[1] Craig, Giles, Bland, and Tazewell counties, Virginia. Thus it includes all of the Allegheny ridges between the Great Valley of Virginia and the Ohio River, from the Pennsylvania border on the north to the southern extremity of West Virginia. The "Ridge and Valley province" (of Fenneman, 1938) lying directly east of this territory, and the high Blue Ridge peaks of southwestern Virginia are excluded, since it is felt that their biotic conditions differ in a number of essentials from those of the area under consideration.

From the ornithological standpoint, the region is remarkably homogeneous, although the boundaries are somewhat arbitrary. Portions of southwestern Pennsylvania, the unglaciated Allegheny plateau of eastern Ohio, and parts of southwestern Virginia and eastern Kentucky might well have been included, had it not been that these areas are receiving adequate ornithological treatment at other hands.

Embracing a portion of the divide between Atlantic seaboard and Ohio-Mississippi drainage systems, the region offers a natural meeting place for forms of life which follow the mountain ridges down from the north, which gain entrance from the south through unobstructed river valleys, or which invade the area from both the

[1] There is frequent confusion in literature as to the various spellings of the mountains, and some of the geographical divisions, with which this paper deals. For purposes of clarity it may be stated that the United States Geographic Board has adopted the spelling *Allegheny* for the mountains and river, *Alleghany* as the name of the county in Virginia, and *Allegany* for the county in Maryland. Usage of the names in the present paper conforms to the Board's rulings.

east and the west. At such a junction point northern and southern, and eastern and western, bird races meet, with somewhat puzzling intermediates becoming the rule rather than the exception.

The Problem

So many excellent papers on the ornithology of this territory have appeared that another one would scarcely seem justified, were it not that one factor of tremendous ecological significance has not received the attention which it deserves.

Briefly stated, this factor derives its significance from just one circumstance; within one or two generations the forests of this considerable area, relatively undisturbed for thousands or perhaps millions of years, have undergone wholesale destruction from man's lumbering operations, from the attendant fires which have swept much of the region, and from the plant diseases which have been introduced. Thus birds which had become, over long periods, habituated to a certain set of living conditions have found themselves within a comparatively short time faced with the problem of adjusting themselves to different conditions, or of disappearing from a considerable portion of their ancestral breeding range.

Because of the fact that many of these upland watersheds have now been taken over for administration as forest land by the United States Forest Service, state conservation departments, and other public agencies, we may well doubt that any such wholesale changes in the character of the country as have taken place within the last fifty years will ever occur again. Thus we are contemporaries of the birds in this transition period, and it behooves us as ornithologists to record all that we can learn of their attempts at readjustment. Fortunately, there are those still with us who can remember many of the Allegheny forest regions when they were in near-pristine condition, and we are able to draw from their memories and their records when we attempt to contrast the bird life of virgin and of cut-over areas.

To the birds, this period of rapid change, induced by man's lumbering methods, may well have been as socially significant as was the industrial revolution to human beings. Certainly we know that many species have profoundly changed their habits since the coming of the white man, as witness the Chimney Swift's readiness to adopt new breeding situations. Reference to a bird list made in the West Virginia spruce belt forty years ago, and to one made in the same region today, will show the striking ornithological changes which have occurred. Some species may have disappeared locally, and many new ones have appeared; the bird life may in fact be considerably enriched. Whatever these shifts may have been, however, practically all breeding birds of the area are now living under radically changed conditions.

There is an element of immediacy in this study. Within the region defined by this paper there are a few, but very few, scattered remnants of original deciduous and coniferous forests. Where these occur, birds may still be observed under conditions which approximate those which once obtained throughout the area. So rapidly are these virgin stands being removed, however, that a few more years may well see their practical disappearance. Unfortunately, it is not the policy of the U. S. Forest Service, at least in eastern United States, to buy and preserve original timber stands.

In areas which have undergone lumbering operations, conditions change very quickly. This is a region of rapid tree growth and heavy timber increment, and cut-over areas, even though practically denuded, are quickly clothed in vegetation which may be widely different from that which originally occupied the land. Under highly favorable lumbering methods, when fire is kept out, reforestation by the original species may occur, and here we find a minimum of disturbance to the bird life. Such happy combinations of circumstances have, unfortunately, been rare in our region. Generally speaking, vegetational changes occur in rapid succession, and he who would mark attendant changes in bird life must be on the ground, and must have ample basis for comparison and contrast.

Another contemporary change of tremendous import in the forests of the mid-Appalachian region has resulted from the introduction and spread of the chestnut bark disease (*Endothea parasitica*). On many of the Allegheny ridges American chestnut (*Castanea dentata*) was the principal timber species, and the death of the chestnuts, now unfortunately almost complete throughout the region, has left standing millions of dead trees which once helped to form a forest crown. The exposed understory vegetation is bringing about reforestation of a very different character. The dense brushy growths which have followed the death of the chestnuts have favored the nesting of a number of bird species which had previously been scarce in, or absent from, these forests. In fact, a definite association of breeding warblers in such situations may now be found throughout the area. Certain warblers (the Golden-winged is notable) seem almost to depend on standing dead chestnut trees for perches from which song is given.

This new association of species in brushy areas is one of the most interesting features of bird life in the Allegheny region today. Under the discussions of individual species it will be covered more fully. That the association is a temporary one, however, may be inferred from the fact that a few more years will see the fall of all standing dead chestnut trees, and will find the present brushy areas grown up to a new type forest.

The writer has spent practically his entire lifetime in the region which this paper includes, has camped in original stands of red spruce, hemlock, pine, and deciduous forests, and has had opportunities for

study throughout the region. In addition, full advantage has been taken of the work of others in the same field. Recognizing that no one person could possibly do justice to so large an ecological field, he nevertheless ventures to place on record some observations relating principally to the breeding wood warblers of the region, and to draw from these observations some conclusions, with the hope that they may be modified, enriched, or enlarged through the experiences of others.

The Wood Warblers

For the purposes of this study the warblers of the Family Compsothlypidae have been selected for a number of reasons. In the first place, a large number of species breed within the area, the list including twenty-seven species, one hybrid (Brewster's Warbler), and an undetermined number of races which are known to nest, together with two or three species whose presence has been noted during the breeding season, but whose nests have not yet been found.

A second consideration is that no portion of the region is without its characteristic breeding warblers, some areas numbering twenty or more species. Another significant circumstance is that the breeding warblers are rather well distributed as to their centers of abundance. The mountain ridges harbor many species of northern association, while the region's position on the borderland of the south gives it a good representation of Carolinian forms. By far the most clearly defined biotic zone of the region is the Alleghenian portion of the Transition (as Merriam conceived it). This zone has a particularly well developed warbler population. Finally, the breeding warblers serve fairly well to delineate the biotic zones into which the territory falls.

Life Zones in the Region

The writer enters into a discussion of life zones with some trepidation, knowing that there are many biologists who question the validity of any or all the zone concepts so far proposed. Without going too deeply into the matter, a few general observations are ventured. The first is that, by general agreement, biotic zones are more clearly defined in a mountainous than in a flat country, and we are dealing here with a mountainous region. Secondly, much of the criticism directed against any given life zone concept has had reference to the methods and criteria by which the zones were set up, leaving unchanged the basic fact that sharply defined and highly different associations do exist side by side. Again, much of the criticism of any life zone system has seemed to me fallacious in that it considers too narrow a portion of the biotic field. In a given region the bird life may be poorly zoned, whereas plant life, or even mammal life may show zonation much more clearly.

It should be made clear that references to zones in this paper consider them as associations of plant and animal life, not narrowed to the ornithological, or any other, field. For such associations the name *biome* has been proposed, and its use offers many advantages. The writer believes, however, that the more familiar *life zone* is justified, if it be remembered that the term carries broad sociological connotations.

Without reference, therefore, to the criteria by which zones have been separated, and with no brief for any particular zone system, Merriam's, Dice's, or any other, the fact remains that the mid-Allegheny region which this paper treats shows fair sized areas where the biota are definitely of the association which has been known as Carolinian, a much larger area which falls in the Alleghenian, and smaller, but in some cases sharply defined, territories where both fauna and flora are predominantly (if not purely) Canadian.

In our region only the larger valleys, notably the valleys of the Ohio and the New River-Great Kanawha River systems, are predominantly Carolinian. Among the warblers, only the Blue-winged and the Sycamore, with, perhaps, the Prothonotary, are restricted to this zone. However, Yellow, Cerulean, Prairie, Kentucky, and Pine Warblers, Yellow-breasted Chat, and Louisiana Water-thrush reach their greatest abundance here.

The forests of this region are predominantly southern mixed hardwoods, with considerable stands of scrub pine (*Pinus virginiana*) and pitch pine (*P. rigida*) on the more sterile hills. The picture is complicated, however, by occasional cold ravines where hemlock (*Tsuga canadensis*) and other more northern species are to be found, and in these may be found breeding warblers which normally occur only at higher elevations or latitudes.

If there be such a thing as the Alleghenian province of the Transition zone, our region represents it *par excellence*. Only a few years ago a prominent ornithologist stated in a national scientific meeting his belief that the Alleghenian is not a valid biotic division, in so far, at least, as birds are concerned. It seems to me that recent systematic work tends strongly to establish the opposite view. Such Alleghenian forms as Mountain Vireo, Cairns's Warbler, and Carolina Junco have long been known, while Burleigh has recently named the Southern Creeper (*Certhia familiaris nigrescens*) and the Southern Winter Wren (*Nannus troglodytes pullus*), and Dr. Oberholser has described a southern Appalachian race of the Black-capped Chickadee (*Penthestes atricapillus practicus*). It is true that the latter three are more common in the Canadian portion of the southern mountains, but they have apparently separated out in the general region under consideration.

By the very definition of the word, much of the mid-Allegheny territory falls marvelously well into a transition area. Where else may Yellow-breasted Chat and Mourning Warbler breed in the same

thicket, Black-throated Green Warbler and Cerulean Warbler nest in the same beech woods, and Louisiana Water-thrush and Northern Water-thrush find homes along the same stream?

In our territory Golden-winged Warbler (and perhaps Brewster's Warbler) seem to be restricted to the Alleghenian zone, while Worm-eating, Hooded, Black and White, Blackburnian, Parula, and Chestnut-sided Warblers, Oven-bird, and Redstart here reach their greatest abundance. Every breeding warbler known from the territory, save the two or three species previously mentioned as being restricted to the Carolinian, has been found in the Alleghenian.

The interesting association of breeding warblers (mentioned earlier in the paper) which has followed the death of American chestnut trees occurs almost exclusively in the Alleghenian province. Dense thickets which occur under standing dead chestnut trees are frequently made up of chestnut sprouts, rhododendron (*R. maximum*), mountain laurel (*Kalmia latifolia*), blackberries (*Rubus sp.*), scrub oak (*Quercus ilicifolia*), wild grapes (*Vitis sp.*), black locust (*Robinia pseudo-acacia*), and other scrubby growth. In these thickets Black and White, Golden-winged, Magnolia, Cairns's, Chestnut-sided, and Canada Warblers, Oven-bird, and Yellow-breasted Chat breed regularly, often in abundance. At higher elevations Mourning Warblers join this group, while at lower and intermediate elevations Hooded Warblers are common. Where there are living trees of some size Blackburnian Warblers and Redstarts are also abundant.

Thus we have ten or twelve warbler species regularly occupying a special type of habitat which must be new to them, at least on so extensive a scale.

At least two warblers of southern association, Hooded and Worm-eating, are more common in the Alleghenian than in the Carolinian portions of the territory which this paper discusses. This may well be due to the fact that suitable breeding habitats for these birds are more common at elevations slightlty above the larger river valleys.

In the northern portion of the region under consideration the Alleghenian division of the Transition zone descends as low as 1000 feet elevation, and usually gives way to the Canadian at about 3500 feet. In the southeastern portion of the area the Alleghenian begins at about 1500 feet and ascends to 4000 feet or more. Dr. J. J. Murray and Professor Ruskin Freer do not consider that any of the Allegheny peaks in Virginia reach the Canadian zone. In Giles County, Virginia, near the southern extremity of our region, the Alleghenian begins at about 2000 feet, and points which rise to 4300 feet fail to show much evidence of a Canadian character.

Since by far the largest portion of the whole area under consideration lies between elevations of 1500 feet and 3500 feet, it can be

seen that the Alleghenian is the most extensive (and most significant) biotic division with which we have to deal.

Several types of forest occur within the area, and serve to show the striking 'transition' nature of the region. Southern mixed hardwoods, with some pitch pine, occur at the lower elevations, while stands of oak-chestnut-hickory come onto the dry ridges. Northern hardwoods (birch-beech-maple-basswood) are common above 2000 feet, and there are many coves where walnut and tulip poplar (*Liriodendron tulipifera*) are abundant. Hemlock is to be found along many streams, while on the eastern slopes of the Allegheny ridges there is a considerable stand of white pine (*Pinus strobus*). As rainfall decreases toward the eastern edge of the region scrub and pitch pines, and scrubby oaks become abundant.

Dr. J. J. Murray has recently published (1939c.) an excellent study of the Canadian zone (or modified Canadian zone) as it occurs in the southern Appalachians. He concludes that Virginia has no true Canadian zone territory, but believes that the high Allegheny ridges in Highland County (as well as the elevated Blue Ridge peaks near the North Carolina line) approach this zone. Western Maryland now has no Canadian area save, perhaps, the small portion of Cranesville Swamp which lies within Garrett County. This leaves, within the territory of this paper, only certain high mountainous areas in West Virginia to represent the Canadian, or modified Canadian, zone.

The original forest of red spruce (*Picea rubra*) pretty closely delimited the Canadian zone in West Virginia. Although the state once had over 700,000 acres in almost pure stand of this species, most of the spruce timber has been removed within the last fifty years. Clear cutting of the timber has all too frequently been followed by destructive fires, and spruce has been replaced, to a great extent, with hardwoods. Where this has occurred the Canadian character of the country has largely been lost, such areas now being clearly referable to the Alleghenian.

Fortunately, there is one considerable region where a combination of circumstances has acted to preserve the Canadian character of the country. This lies within Tucker, Randolph, and Pocahontas Counties, West Virginia, and includes a series of high mountain ridges and elevated plateaus known locally, and rather loosely, as Cheat Mountains. Actually the range is made up of Cheat Mountain, Shavers Mountain, Back Allegheny Mountain, and a number of other spurs and ridges.

Much of the Cheat Mountains area was lumbered under selective cutting methods, and fires in the region have not been extensive. With abundant rainfall (the nearest comparable station has recorded an average yearly precipitation of about sixty inches), reforestation of the original spruce has occurred extensively, and plant and animal life has

been subjected to a minimum of disturbance. About one hundred square miles of the Cheat section lie above 4000 feet, and there are extensive areas above 4500 feet. The maximum elevation is 4842 feet. The region is, perhaps, the nearest thing to a true Canadian forest which can be found in eastern North America south of the Catskills.

The high ridges of the Cheat Mountains catch the moisture-laden winds from the west, and a heavy precipitation results. Equally high ridges, notably Allegheny Backbone and Allegheny Front, which lie directly to the east are thrown into a rain shadow, and on these no extensive reforestation of Red Spruce has occurred. With the disappearance of the spruce, other Canadian species have also largely failed of survival.

Where red spruce within the Canadian zone does not occur in pure stands there are mixtures of spruce with yellow birch (*Betula lutea*), large-toothed aspen (*Populus grandidentata*), hemlock, and fir (*Abies sp.*)

In addition to the Cheat Mountains, there are several smaller areas where Canadian forms predominate. Cranberry Glades, Pocahontas County, is notable, as are Canaan Valley, Tucker County, and Cranesville Swamp, partly in Preston County, W. Va., and partly in Garrett County, Md.

No warblers, save possibly the Nashville, are restricted in our area to the Canadian zone, although Cairns's, Black-throated Green, Mourning, Canada, and Magnolia Warblers, and Northern Water-thrush here reach their greatest abundance. A much better idea of the bird life of the area can be secured if we list the following breeding species which are, generally speaking, restricted in this region to the Canadian: Saw-whet Owl, Olive-sided Flycatcher, Red-breasted Nuthatch, Brown Creeper, Winter Wren, Hermit and Olive-backed Thrushes, Golden-crowned Kinglet, and Purple Finch. To these might be added Pine Siskin and Red Crossbill, both of which have been observed in summer in the Cheat range.

In pure spruce forests not a single one of the warblers whose centers of abundance are to the south (i.e., Kentucky, Hooded, Cerulean) occurs.

Recent Shifts in Bird Populations

Dr. W. C. Rives, pioneer student of the birds of the Virginias, states (1898),

> ". . . I spent the period from June 4 to June 12, 1891, at Davis, [Tucker County, W. Va.] finding the general aspect similar to that of Maine or northern Wisconsin, rather than in accordance with one's preconceived ideas of a southern State, and the avifauna, as might have been anticipated, markedly Canadian and Alleghenian in character . . ."

On this and subsequent visits, Dr. Rives found large areas of virgin spruce still standing, but he notes that lumbering was well under way in the region. During a number of trips to the region he lists only

the following warblers: Black-throated Blue (noting that some were typical Cairns's), Magnolia, Black-throated Green, Chestnut-sided, Mourning, and Canada Warblers, Northern Water-thrush, and Maryland Yellow-throat. Of these he records that Chestnut-sided and Mourning Warblers were found in the clearings, not in the spruce forests, and that the Yellow-throat was not noted in 1891, but was observed in 1897. Thus, only five warbler species were found in the spruces.

In the years since Dr. Rives visited this portion of West Virginia the whole area has been lumbered by extremely destructive methods, and much of the land has been burned over. No substantial spruce reforestation has taken place, and most of the territory is now covered with a brushy deciduous growth. Despite the sharp vegetational transition, all of the warblers recorded by Dr. Rives may still be found in the neighborhood (some of them in rather restricted areas), and the following additional species have been noted: Black and White, Worm-eating, Golden-winged, Nashville (George M. Sutton and William Lunk), Parula, Yellow, Blackburnian, and Hooded Warblers, Louisiana Water-thrush, Oven-bird, Yellow-breasted Chat, and Redstart. It seems certain that Dr. Rives and his companions would not have overlooked all of these, and I believe it is a fair assumption that most, if not all, of these species have moved into the area since the original spruce was cut.

During the summer of 1914 an ornithological party camped for ten days along Shavers Fork of Cheat River, in Randolph County, W. Va. The notable thing about the whole experience was the abundance of a very few species of birds found in the dense red spruce forest, and the small number of species found. Our warbler list read much as did that made by Rives in an adjoining county, save that Chestnut-sided and Mourning Warblers, and Yellow-throat were absent. We did note Blackburnian Warblers.

Although this territory is in the Cheat range, where favorable lumbering methods obtained, and good spruce reforestation has occurred, warbler lists made during recent summers have included all species mentioned in the paragraph above, together with Black and White, Worm-eating, Parula, and Hooded Warblers, Oven-bird, Yellow-breasted Chat, and Redstart. It seems certain that most of the additional species are recent arrivals (as breeding birds) in the region.

Failure of the red spruce to reseed in the less abundantly watered mountains just to the east of the Cheat ranges has already been mentioned. In these, even at high altitudes, all warbler species previously noted as occurring in the Alleghenian zone may be found.

Just as many Alleghenian species have occupied territory once Canadian in its associations, so have species, predominantly Carolinian, been able to occupy parts of the Alleghenian. This movement of

southern association species has been particularly striking in central West Virginia. Within the last few years such species as Cerulean and Prairie Warbler, heretofore unknown in the territory, have become common breeding birds at French Creek, Upshur County, W. Va., at elevations from 1400 feet to 1800 feet.

As a result of the removal of the original forest stands, therefore, the Carolinian zone has been somewhat extended in the territory which this paper covers, the Alleghenian zone has been greatly enlarged, and the Canadian has been sharply reduced. As natural and artificial spruce reforestation takes place, the Canadian zone may increase in size, with a corresponding decrease in the size of the Alleghenian area. On public lands at least it is doubtful if clear cutting on so extensive a scale will ever again be the prevalent lumbering method. It will be a matter of interest for future ornithologists to note which of the changes mentioned above are temporary in nature, and which represent more permanent shifts in bird populations.

Breeding Warblers in the Region

In preparing notes on the warblers which breed in the central Alleghenies, two striking circumstances early became apparent. They are:

1. Certain warblers are to be found breeding here in habitats which are very different from those occupied in other portions of their ranges.

2. Many warbler species are here nesting in a greater variety of habitats within a single area than is, seemingly, the case in other portions of their ranges.

Notes on individual species which follow will demonstrate the basis for these conclusions. Reference might be made here to two striking examples; the Golden-winged Warbler which in Ohio and Michigan is restricted almost entirely to swampy areas, but which is abundant in West Virginia only on dry upland ridges; and to the Black-throated Green Warbler, breeding only in coniferous forest throughout most of its range, but nesting in a variety of deciduous associations as well in the central Allegheny region.

Mniotilta varia. Black and White Warbler. Resident at present throughout the region covered by this paper; formerly scarce or absent in the Canadian red spruce belt. This species reaches its greatest abundance at medium elevations in the Alleghenian zone, and is less common at lower elevations in the large river valleys. It is a characteristic bird of the "chestnut sprout" association. Recorded at elevations up to 4600 feet on Spruce Knob, Pendleton Co., W. Va.

Nesting dates: French Creek, Upshur Co., W. Va., May 24, 1926, four eggs (M. Brooks); Mt. Lake, Giles Co., Va., May 26, 1937, five eggs (D. R. Hostetter); Pleasants Co., W. Va., May 29, 1938, young birds (C. Conrad).

Protonotaria citrea. Prothonotary Warbler. There are very few records of this bird from our region and those few are largely uncertain. Doan (1888) reports a specimen taken near Buckhannon, Upshur Co., W. Va., on August 3, 1887,

but his collections have never been found, and much of his work is regarded as unreliable. Hicks (1935) states that the species is known to breed in Washington Co., Ohio (directly across the Ohio River from West Virginia), and it will probably be found nesting along some of the larger streams of the region with which this paper is concerned.

Limnothlypis swainsoni. Swainson's Warbler. Since the early days of American ornithology this little-known warbler has been considered a resident of the cane brakes and coastal swamps of the deep South. However, recent discoveries are forcing us to re-orient our thinking as to the species.

When Bibbee (1934) took an adult male Swainson's Warbler at Buzzard Rocks, Monongalia Co., W. Va., on June 14, 1924, his bird was regarded as of purely accidental occurrence, particularly as it was taken in a region of hemlock, rhododendron, and mountain laurel, only a few miles from the Pennsylvania border. Somewhat later, Mr. F. M. Jones, of Bristol, Tenn., collected a nest and eggs which he identified as of this species in the mountainous portion of southwestern Virginia, but, even with this evidence, the find was not accepted by ornithologists in general.

Williams (1935) called attention to the presence of the species near Tryon, in the mountains of western North Carolina, in May, 1934 and 1935. He notes that the birds were found in open places as well as in laurel thickets. During his work in West Virginia, Wetmore (1937) collected a male near Fourteen, Lincoln Co., at the swampy border of a little upland stream. Wetmore (1939) also collected a male, and observed two other individuals, in the mountains of eastern Tennessee, at elevations between 2600 feet and 3000 feet. He notes that they were in a swampy area heavily shaded by hemlock and rhododendron. Legg (1939) found birds which seem to have been of this species in rhododendron and mountain laurel thickets in Nicholas Co., W. Va., at points about three miles apart. Murray (1939b), in the light of other recent records, has accepted as valid the southwestern Virginia record made by Jones, and mentioned in the preceding paragraph.

With so much evidence at hand, it is becoming clear that a portion of the Swainson's Warbler population must be looked for over a wide area in the central and southern Appalachian region. Although Jones' nest is the only one actually recorded to date, there are so many additional summer records from the territory that the more extensive breeding of the species is strongly indicated.

Helmitheros vermivorus. Worm-eating Warbler. Distributed in regions of deciduous woods throughout the area; more common at lower elevations in the Alleghenian zone. It has not been recorded in the spruce belt, although it reaches elevations of 3600 feet in northern hardwoods association on the slopes of the Cheat mountains, Randolph Co., W. Va.

Nesting dates: Orlando, Lewis Co., W. Va., May 27, 1914, five eggs (E. A. Brooks); French Creek, Upshur Co., W. Va., May 24, 1917, five eggs (F. E. Brooks).

Vermivora chrysoptera. Golden-winged Warbler. As noted earlier in this paper, the Golden-winged is a characteristic bird of the dead chestnut ridges throughout the central Allegheny region. It is much less common in the larger river valleys, and has not been found in pure spruce, stands, although Wetmore (1937) found it breeding at 3300 feet at Cranberry Glades, Pocahontas Co., W. Va.

Shunning the swamps which it frequents in other portions of its range, it is highly characteristic of the "chestnut sprout" association, where the males choose dead chestnuts for perches from which to sing. It is also fairly common in the pitch and scrub pine regions on the hills just back of the Ohio river, but becomes less common toward the eastern portion of the territory with which this paper deals. It ascends to at least 4000 feet in Giles Co., Va.

Nesting dates: French Creek, W. Va., May 30, 1919, five eggs (M. Brooks); Pleasants Co., W. Va., May 29, 1938, two young just out of nest (Tom Shields).

Vermivora pinus. Blue-winged Warbler. In our area seemingly restricted to the Carolinian zone in the lower river valleys. There are scattered migration records at points of higher altitude, but no actual breeding records. My notes indicate that these birds are locally common in the West Virginia counties along the Ohio River, but that they do not reach the eastern portions of the high Alleghenies. It is quite possible, however, that this view will require revision, since Sprunt (1930) found the species at elevations of 3000 feet in western North Carolina.

In the Ohio valley counties the birds inhabit mixed southern hardwoods, oak-hickory, and scrub pine areas. I do not know of their occurrence above 1200 feet. Males have a liking for dead trees as singing perches, a tendency in which they closely resemble the Golden-winged Warblers.

Nesting date: Cedar Rocks Country Club, Marshall Co., W. Va., June 10, 1932, four young (C. B. Upton).

Vermivora leucobronchialis. Brewster's Warbler. There are comparatively few places within our territory where Golden-winged and Blue-winged Warblers meet as breeding birds, and there are no actual nesting records for this warbler, or for the other hybrid. Lawrence's Warbler. Sutton has collected in Brooke Co., W. Va., a specimen of Brewster's Warbler which was in breeding condition, and Lunk (1938) tells of seeing a male Brewster's apparently feeding a young bird and associating with a female Golden-winged Warbler near Fairmont, Marion Co., W. Va. This bird, seen by a number of persons, occupied a brushy hillside throughout the summer. It sang regularly, and gave all indications of nesting in the neighborhood. If breeding actually occurred, it constitutes one of the most southern records for the species.

Vermivora ruficapilla ruficapilla. Nashville Warbler. Restricted in summer to the higher parts of the territory. It has been noted at Cranesville swamp, Preston Co., W. Va., by A. B. Brooks and Mr. and Mrs. Harold Roush, and in nearby parts of Garrett Co., Md., by Karl Haller and the writer. S. S. Dickey has reported it from Cranberry Glades, and is certain that it has bred in this locality. Dr. Sutton and Lunk have found it on Canaan mountain, Tucker Co., W. Va., the only place outside of an extensive swamp where it has been found in the region with which this paper deals. No nest has been recorded.

Compsothlypis americana pusilla. Northern Parula Warbler. Specimens taken within our area have been referred to this race. The bird breeds locally in an astonishing variety of situations. It occurs in southern mixed hardwoods, in oak-hickory associations, in northern hardwood types, in oak-pine scrub, in hemlock ravines, in almost pure stands of white pine, and, at the edges at least, of spruce stands. I have seen nests in white oak and in sycamore (*Platanus occidentalis*). It occurs at 3500 feet on Elk Mountain, Pocahontas Co., W. Va.

Where there is standing live timber of some size, these birds are not uncommon in areas of dead chestnut, although the species should hardly be included in the "chestnut sprout" association.

Nesting dates: Dunkard Creek, Monongalia Co., W. Va., June 19, 1897, fragment of one egg in nest (J. W. Jacobs); French Creek, W. Va., May 29, 1916, four eggs (M. Brooks).

Dendroica aestiva aestiva. Eastern Yellow Warbler. Abundant in the river valleys; common in the lower parts of the Alleghenian zone, becoming less so at higher elevations. Not recorded in spruce forests. The species now occurs at Davis, Tucker Co., W. Va., at 3100 feet, an area that was in the original spruce belt as described by Rives (1898).

Nesting dates: French Creek, W. Va., May 24, 1919, five eggs (M. Brooks); Ice's Ferry, Monongalia Co., W. Va., May 17, 1935, four eggs (M. Brooks).

Dendroica magnolia. Magnolia Warbler. Common, often abundant, in Garrett County, Md., the mountainous counties of eastern West Virginia, and on the higher ridges of the Virginia counties which this paper discusses. The species shows a fairly wide choice of breeding habitats; it is found regularly in the "chestnut sprout" association, occurs in northern hardwood types, and is often abundant in virgin or second-growth spruce. Even on the comparatively dry eastern slopes of the Alleghenies (Pendleton Co., W. Va.) I have found the birds in summer at elevations as low as 1800 feet, in beech-maple forest. In Giles County, Virginia, the birds have been noted as low as 2500 feet.

Nesting date: Terra Alta, Preston Co., W. Va., June 24, 1933, four eggs (M. Brooks).

Dendroica caerulescens cairnsi. Cairns's Warbler. Common in western Maryland, the Virginia counties of this paper, and West Virginia counties with elevations above 2000 feet. Like the Magnolia Warbler, this bird is a characteristic resident of the "chestnut sprout" association, is found in northern hardwoods, and in spruce at all stages of growth. It is also found in white pine stands. Murray (1936) has noted the species at elevations of 1500 feet in Virginia, and I have seen it at 1600 feet in West Virginia.

Wetmore (1937) considers that all the specimens which he has seen from the region (with the possible exception of some from western Maryland) are referable to this race, although Hicks (in correspondence) was unable to distinguish any differences between specimens taken in Preston Co., W. Va., and Garrett Co., Md., and those from New Jersey and other more northern points. It is certainly true that some northern West Virginia birds could easily be referred to *D. c. caerulescens.* There is no sharp dividing line between the northern and southern races, the two meeting at points very near the northern boundary of the area which this paper discusses.

Nesting date: Terra Alta, W. Va., May 27, 1935, four eggs (M. Brooks).

Dendroica virens virens. Black-throated Green Warbler. This species, in its distribution within our area, presents one of the most puzzling problems with which we have to deal. It occurs everywhere at high elevations, in spruce, hemlock, northern hardwoods, white pine, oak-pine scrub, and oak-hickory. In Monongalia Co., W. Va., (in hemlock, along Cheat River) it nests at 1000 feet elevation, and Murray (1936) has found it at 1200 feet in Virginia.

Jumping over much of central and western West Virginia, it reappears at comparatively low altitudes (800-900 feet) in the scrub pine forests along the Ohio river. Hicks (1935) has pointed to a similar situation in Ohio, where the birds nest in a number of the unglaciated counties in the southeastern part of the state.

Since this species is so commonly thought of as being restricted in its breeding range to coniferous forest, it might be well to emphasize the fact that a number of West Virginia nests have been found in beech and other deciduous trees.

Nesting dates: French Creek, W. Va., June 2, 1926, four eggs (F. E. Brooks); French Creek, W. Va., June 11, 1933, three eggs (M. Brooks).

Dendroica cerulea. Cerulean Warbler. A characteristic bird of the counties along the Ohio river in West Virginia, rare or absent from western Maryland, the higher mountains in West Virginia, and the higher Virginia Alleghenies, but reappearing sparingly at lower elevations eastward. Murray (1936) and Freer (1939) have found it uncommon or rare in western Virginia at elevations up to 1200 or 1400 feet. This is one of the species which seems to be spreading into the Alleghenian zone in central West Virginia, since it has occurred regularly at French Creek (1700 feet elevation) in recent years. In fact, at this place Cerulean and Black-throated Green Warblers nest in the same small woodland.

To find the bird in maximum abundance however it is necessary to visit

the southern mixed hardwood and oak-hickory forests in west-central West Virginia. No other resident warbler sings regularly so late in the summer, and so persistently during the hottest parts of July and August days.

Nesting date: Jackson's Mill, Lewis Co., W. Va., July 27, 1936, four young (M. Brooks).

Dendroica fusca. Blackburnian Warbler. This species is equally at home in the lush spruce forests and on the dry, deciduous-forested Allegheny ridges within our territory. Like the Golden-winged Warbler, it often selects dead chestnut trees from which to sing. Murray and Freer report it as common above 1500 feet in western Virginia, with occasional birds found in summer as low as 1200 feet.

It does not occur over most of western West Virginia, but may breed locally in Hancock County, at the extreme tip of the state's Northern Panhandle.

Despite its abundance and wide distribution, I have no nesting records from the region of this paper.

Dendroica dominica albilora. Sycamore Warbler. Most of the records for this bird within our territory come from the larger river valleys, and we have no evidence of its having nested outside the Carolinian zone. Scott (1872) tells of a breeding pair taken by W. S. Edwards near Coalburg, Kanawha Co., W. Va., in July. A. B. Brooks and others have found the species in Ohio Co., W. Va., and Margolin and the writer have seen it in Kanawha and Mason Counties, W. Va.

C. O. Handley reports a bird seen on April 29, 1935, near Covington, Alleghany Co., Va., which he identified as a Yellow-throated Warbler (*D. d. dominica*).

No nesting data from the region under consideration are at hand, although Hicks (1935) states that Sycamore Warblers breed in Lawrence, Gallia, and Athens counties, Ohio. These counties adjoin West Virginia along the Ohio river.

Dendroica pensylvanica. Chestnut-sided Warbler. One of the most abundant warblers in mountainous cut-over areas. It is a characteristic bird of the "chestnut sprout" association, and reaches the edges of the spruce forests. In northern West Virginia it breeds down to 1200 feet, and it occurs up to 4800 feet where the habitat is suitable. Mountain laurel thickets offer a favorite nesting place, and dead chestnut trees are often used as singing places.

Absent from most of the western part of our region, the species reappears in northern Hancock County, W. Va.

Nesting dates: Lewisburg, Greenbrier Co., W. Va., June 12, 1913, one egg (C. O. Handley); Rawley Springs, Rockingham Co., Va., May 29, 1931, five eggs (M. Brooks).

Dendroica pinus pinus. Northern Pine Warbler. Found in the region of this paper wherever there are pine forests, from the Ohio river lowlands to the Allegheny crests at 4000 feet or more. I have not seen the species in summer in spruce, hemlock, or pure deciduous stands, although it is abundant in the oak-pine scrub of the eastern portions of the area. It seems to be distinctly less common in the white pine district than in stands of pitch pine or scrub pine.

Nesting date: Mt. Storm, Grant Co., W. Va., June 5, 1935, young birds (M. Brooks).

Dendroica discolor discolor. Northern Prairie Warbler. One of the species which seemingly has greatly extended its range within recent years. The Prairie Warbler is, with us at least, preeminently a bird of the brushy ridges, and the removal of the original forest has facilitated an increase in the breeding range of the species.

Occurring from the Ohio river to the eastern borders of the area under discussion, the birds skip over the heavily wooded mountains, but occur at 4000

feet on Potts mountain, Craig Co., Va., a comparatively dry and open locality. For some reason the range does not include northwestern West Virginia, where the species is rare, or not recorded.

Nesting dates: French Creek, W. Va., June 12, 1929, five eggs (F. E. Brooks); Pleasants Co., W. Va., May 29, 1938, three eggs (H. McGill and L. Tighe).

Seiurus aurocapillus. Oven-bird. One of the most abundant, and widely distributed, warblers of the Allegheny ridges, absent from the older spruce stands, and less common at lower elevations in the river valleys. There are some sections in the upper Ohio valley where the birds are unaccountably missing.

Oven-birds are to be found everywhere in the "chestnut sprout" association, and ascend to elevations above 4000 feet where the timber has been removed.

Nesting dates: French Creek, W. Va., May 21, 1928, five eggs (M. Brooks); Junior, Barbour Co., W. Va., May 26, 1930, five *pure white* eggs (F. E. Brooks); Mt. Lake, Giles Co., Va., May 23, 1937, five eggs (D. R. Hostetter).

Seiurus noveboracensis noveboracensis. Northern Water-thrush. This species, found along some of the mountain streams and in swamps at high altitudes, reaches its known southern breeding limits at Cranberry Glades, within the area with which this paper deals. It is confined to the Canadian and upper Alleghenian zones, nesting as low as 2500 feet at Cranesville swamp in West Virginia and Maryland. Eifrig (1933), writing of western Maryland, observes, "The same stream may harbor the Louisiana and Northern Water-thrushes as breeding birds. . . ."

These warblers show a preference for streams that are lined by spruce, hemlock, or rhododendron, or a combination of these, but they may occasionally be found in northern hardwood forest. Grinnell's Water-thrush (*S. n. notabilis*) has been taken in West Virginia during migration, but there is no present evidence to indicate its breeding within our area.

I have no local nesting data for Northern Water-thrush.

Seiurus motacilla. Louisiana Water-thrush. Normally the first migrant warbler to arrive in the spring, widely distributed below 3000 feet, and occurring sparingly up to 3500 feet. In the lower river valleys the birds seem less abundant, possibly due to a smaller number of suitable breeding habitats. In the lower and middle portions of the Alleghenian zone, however, there is scarcely a woodland stream without one or more pairs.

Nesting dates: French Creek, W. Va., April 19, 1935, three eggs (M. Brooks); Tomlinson's Run, Hancock Co., W. Va., June 5, 1938, two young (R. Murray).

Oporornis formosus. Kentucky Warbler. A common bird in the western portions of the area, absent from the spruce regions of the higher mountains, and becoming much less common on the eastern slopes of the Alleghenies. Wetmore (1937) found it in eastern Hardy County, W. Va., and there are a few western Virginia records. It occurs up to 3600 feet, in northern hardwoods, on Cheat mountain, Randolph County.

The birds seem at home in a number of forest types, southern mixed hardwoods, scrub and pitch pine mixtures, oak-hickory, and northern hardwoods. Nests are often placed close to the borders of a woodland trail or road. As with many other sylvan birds, ravines seem especially to attract them.

Nesting dates: French Creek, W. Va., May 19, 1926, four eggs (M. Brooks); Pleasants Co., W. Va., May 29, 1938, two nests, one with three and one with five eggs (B. Quantze, H. Bergner, R. West).

Oporornis philadelphia. Mourning Warbler. Resident in the higher portions of the area at least as far south as Cranberry Glades, W. Va., and Top of Allegheny, Highland Co., Va. Through western Maryland and northern West Virginia the line of distribution follows the 3000 foot contour mark with surprising accuracy. Cranberry Glades is the most southern known breeding station for the bird.

Mourning Warblers are completely at home in the higher parts of the "chestnut sprout" regions. Tangles of laurel and rhododendron, and blackberry thickets are often selected as nesting sites. The birds invade the edges of spruce cuttings, but are seldom found in stands of mature timber, either deciduous or coniferous.

Nesting date: Cheat Bridge, Randolph Co., W. Va., June 26, 1935, young birds (P. Wyss and R. West).

Geothlypis trichas brachidactyla. Northern Yellow-throat. Perhaps the most widely distributed warbler in the entire region. Since the spruce has been cut, Yellow-throats have invaded the highest mountains and are now abundant at all altitudes.

Wetmore (1937) concludes that the breeding birds (at least throughout most of our area) are of the present race, although he suggests that the Maryland Yellow-throat (*G. t. trichas*) may breed in extreme eastern West Virginia, just at the border of our territory.

Nesting dates: Pleasants Co., W. Va., May 30, 1935, one egg (T. Shields); Cranesville, Garrett Co., Md., June 3, 1935, five eggs (M. Brooks).

Icteria virens virens. Yellow-breasted Chat. Of surprisingly wide distribution; found in every part of the entire area except in heavy timber. Thickets of blackberry vines and black locust sprouts are favorite nesting sites. The birds are at home in the "chestnut sprout" association, even at comparatively high elevations. At Cranberry Glades they may be found nesting with such northern association species as Northern Water-thrush and Golden-crowned Kinglet. Murray (1939) records them from Middle mountain, Highland Co., Va., at 4000 feet.

Nesting dates: Warm Springs, Bath Co., Va., May 31, 1924, five eggs (M. Brooks); Covington, Alleghany Co., Va., June 1, 1926, four eggs (M. Brooks).

Wilson citrina. Hooded Warbler. These birds show a preference for areas of deciduous timber, light or heavy. They occur in southern mixed hardwoods, oak-hickory, northern hardwoods, and in "chestnut sprout" areas. On Cheat mountain they nest at 3500 feet, and in Giles Co., Va., they breed at 4000 feet. As with some of the other southern association warblers, these are somewhat less common in northwestern West Virginia.

Nesting dates: French Creek, W. Va., June 3, 1919, four eggs (F. E. Brooks); Rawley Springs, Rockingham Co., Va., May 30, 1929, three eggs (M. Brooks).

Wilsonia canadensis. Canada Warbler. A spruce belt species which has been able to adapt itself to cut-over areas, where it is now an abundant and characteristic bird of the "chestnut sprout" association. It also occurs in northern hardwoods at high elevations. In Preston county, W. Va., it nests at 2000 feet, and Murray (1936) lists it as abundant above 3000 feet in western Virginia. A favorite haunt is a ravine with dense hemlock overstory and an understory of tangled rhododendron.

Nesting dates: Terra Alta, W. Va., June 27, 1932, four eggs (R. West); Mt. Lake, Va., June 24, 1937, four eggs (D. R. Hostetter).

Setophaga ruticilla. American Redstart. Found at all elevations and in every major plant association in the area, but much less common at high elevations in the spruce belt. Probably did not occur at all in the original red spruce stands. The species is often an abundant one in the "chestnut sprout" association.

Nesting dates: Warwood, Ohio Co., Va., May 19, 1935, four eggs (H. Bergner); Pleasants Co., W. Va., May 30, 1935, four eggs (T. Shields).

Summary

This paper presents an ecological discussion of the breeding warblers of the central Allegheny mountain region, the area including extreme western Maryland, West Virginia, and portions of western Virginia counties west of the Shenandoah valley, and south to the southern border of West Virginia.

Evidence is presented to show that breeding populations of birds in the area have had to face two critical problems within a very short time; the virtual destruction of all original timber stands, and the death of the American chestnut from the chestnut blight.

Chestnut sprouts, and other brushy growth, now occupy millions of acres of mountainous country where, only a few years ago, virgin forests stood. The name "chestnut sprout" association is proposed for this temporary growth. In this association a highly diversified group of warblers breed. The group has representatives of both northern and southern affiliations, and includes Black and White, Golden-winged, Magnolia, Cairns's, Chestnut-sided, Mourning, Hooded, and Canada Warblers, Oven-bird, Yellow-breasted Chat, and Redstart.

The Carolinian, Alleghenian, and Canadian life zones, with their breeding warblers, are discussed, and evidence is given to show that the Alleghenian is the most extensive, and perhaps the most significant, biotic division of the area.

Range extensions of various warblers since the removal of the original timber are discussed, the discussion showing that many species have greatly increased the extent of their breeding grounds in the area.

Many warblers in the area under consideration nest in habitats which are strikingly different from those occupied in other portions of their breeding ranges. Also a number of species here occupy a greater variety of habitats than in other parts of their ranges.

Evidence is presented to show that a portion of the breeding population of Swainson's Warbler (*Limnothlypis swainsoni*) is to be found in the central and southern Appalachian mountain region, at elevations up to 3000 feet. Here it occupies hemlock and rhododendron thickets.

The breeding of 27 warbler species, with some additional races and one hybrid (Brewster's Warbler), is discussed.

Literature Cited

Bibbee, P. C.
1934 Birds of West Virginia: A Check-List. *West Va. Agric. Exp. Sta. Bull.* 258.

Doan, W. D.
1888 Birds of West Virginia. *W. Va. Agric. Ex. Sta. Bull.* 3.

Eifrig, C. W. G.
1933 In the Haunts of Cairns's Warbler—A Retrospect and a Comparison. *Wilson Bull.*, 45:60–6.

Fenneman, N. M.
1938 Physiography of Eastern United States. McGraw-Hill Book Co., New York.

Freer, R .S.
1939 The Birds of Lynchburg, Virginia, and Vicinity. *Bull. Lynchburg College*, 7, No. 1: 27.

HICKS, L. E.
1935 Distribution of the Breeding Birds of Ohio. *Ohio Biol. Surv. Bull.*, 32.
LEGG, W. C.
1939 Swainson's Warblers? *Field Ornithology*, 1, 12:14–15.
LUNK, W. A.
1938 Some Observations of Brewster's Warbler. *Redstart*, 6:8–9.
MURRAY, J. J.
1936 The Land Birds of Rockbridge County, Virginia. *Oologist*, 53: 26–35.
1939a Notes from Middle Mountain. *Raven*, 10, 6–7: 9–10.
1939b Swainson's Warbler in Southwest Virginia. *Raven*, 10, 10–11:9.
1939c The Canadian Life Zone in the Southern Appalachian Mountains. *Raven*, 10, 1: 1–5.
RIVES, W. C., JR.
1898 The Summer Birds of the West Virginia Spruce Belt. *Auk*, 15: 131–7.
SCOTT, W. D.
1872 Partial List of the Summer Birds of Kanawha County, West Virginia. *Proc. Boston Soc. Nat. Hist.* 15: 219–27.
SPRUNT, ALEXANDER, JR.
1930 The Blue-winged Warbler (*Vermivora pinus*) and the Sycamore Warbler (*Dendroica dominica albilora*) in the North Carolina Mountains. *Auk*, 47: 90–1.
WETMORE, ALEXANDER
1937 Observations on the Birds of West Virginia. *Proc. U. S. Nat. Mus.* 84: 401–41.
1939 Notes on the Birds of Tennessee. *Proc. U. S. Nat. Mus.* 86: 175–243.
WILLIAMS, E. A.
1935 Swainson's Warbler in the North Carolina Mountains. *Auk*, 52: 458–9.

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THE SEX RATIO IN NESTLING EASTERN RED-WINGS [1]

BY J. FRED WILLIAMS

A NUMBER of studies have been made of sex ratios in birds, and the information available on the subject has been recently summarized by Mayr (1939). He classifies sex ratios as follows: "The primary sex ratio relates to the proportion of the sexes at the time of fertilization, the secondary sex ratio at the time of birth and the tertiary sex ratio during adult life." On the basis of genetics the expected ratio is 50:50 but as shown by Mayr, departures from this are not rare among birds, especially in the tertiary ratio. Of the three ratios the primary is probably of the greatest interest because of its bearing on problems relating to the mechanism of sex determination as well as on those involving details of life history. The existence of an unbalanced primary ratio, if definitely established, would present a problem of fundamental biologic interest. It is also evident that many interesting peculiarities of life history, such as polygamy, the development of social habits, and brood parasitism may be linked with unbalanced sex ratios.

The Red-wing (*Agelaius phoeniceus*) offers a number of advantages as the subject of a study of sex ratios. The species shows striking sexual dimorphism, the differences between the sexes involving size as well as color. It is often highly gregarious in nesting, an important practical point, since studies of this sort require an abundance of data. Lastly, it belongs to a group, the family *Icteridae*, in which unbalanced sex ratios and interesting life history patterns have frequently been found. For example, in Wagler's Oropendola (*Zarhynchus wagleri*) Chapman (1928, p. 135) observed an excess of females and a condition which he termed "limited monogamy," in which the sexual bond was of short duration and each male had several mates in the course of the breeding season. A surplus of females has also been reported by McIlhenny (1940, p. 88) in the Boat-tailed Grackle (*Cassidix mexicanus major*), a species in which there is no pairing and the mating is promiscuous. Friedmann (1929, pp. 77, 173) presents some evidence which indicates that there is an excess of males in the Common Cowbird (*Molothrus ater ater*), which is a brood parasite. Lack and Emlen (1939) found that the Tricolored Red-wing (*Agelaius tricolor*), which nests in large colonies, is polygynous or promiscuous, and that the sex ratio is strongly unbalanced among the adults, with about 47 males for each 100 females.

The Eastern Red-wing (*Agelaius phoeniceus phoeniceus*) exhibits much of the behavior of a territorial species, although there is a strong gregarious tendency and the territories may be very small. Thus the males arrive first, display and sing at rather definite stations, in the

[1] Contribution from the Franz Theodore Stone Laboratory of the Ohio State University, Put-in-Bay, Ohio.

neighborhood of which other males are attacked and driven off. Most of the feeding, however, is done away from the territory. Due to this habit of feeding elsewhere and to the close approximation of the individual territories, it is difficult to determine the sex ratio of the adults and the exact relations that exist between the sexes. Allen (1914, pp. 90-92) records instances of both polygyny and polyandry but apparently believes that the normal relation is one of monogamy. My own observations, in cases where two nests were located in close proximity, have given me the impression that monogamy is the prevailing condition. In the extensive literature, however, one encounters quite different opinions. For example. Roberts (1932, Vol 2, p 306) states that the Giant Red-wing (*Agelaius phoeniceus arctolegus*) is usually polygynous, and Linsdale (1938, pp. 128, 140) found polygyny in small colonies of the Nevada Red-wing (*A. p. nevadensis*). Surprisingly, McIlhenny (1940) says that the Gulf Coast Red-wing (*A. p. littoralis*) is monogamous despite the fact that there is a large surplus of males in the population. The explanation of this apparent anomaly may be found in a statement by the same author that the females breed in their first spring after hatching while the males do not breed until their second year.

In cases where the sex ratio is known to be unbalanced among adults it becomes a matter of no little interest to determine the ratio in the young. This has been attempted in a very few species, the Red-wing among others. McIlhenny (1940) gives a ratio of 3.3 males per 1 female in a large number (420) of Gulf Coast Red-wings, using only data from nests in which the full complement of three eggs hatched. This constitutes a primary ratio in the definition of Mayr (1939). Unfortunately the methods used in sexing the nestlings are not described. Herman (1938) has published ratios for the Eastern Red-wing, based on rather small samples of birds that were trapped and sexed sometime after having been banded in the nest. There were recovered 29 males and 13 females, and the totals for those cases in which complete sets of siblings were recovered were 14 males and 6 females.

Since the Red-wing exhibits a marked sexual dimorphism it might be expected that it would be possible to distinguish the sexes at an early age. Packard (1936) was able to sex individuals in the fully developed juvenal plumage, but not in the nestling stage. In my own work at Put-in-Bay, Ohio, during the summer of 1939 I was unable to find any plumage character or other external mark by which the nestlings might be sexed. In reply to an inquiry from me Mr. E. A. McIlhenny, Avery Island, Louisiana wrote as follows: "The sex of the Gulf Coast Red-wing nestlings can be told with certainty at any time after the fifth day from external appearances of the bill, torso, and general body size." The present paper reports the results of an attempt to find a satisfactory method of distinguishing the sexes of nestlings, together with a brief analysis, by a simple statistical method, of the sex ratios that were found in the nestlings of a single colony.

Methods of Study

The area in which the present study was made consists of a cat-tail (*Typha latifolia*) marsh, about ten acres in extent, located at the northeastern corner of Indian Lake, Logan County, Ohio. It is the site of a refuge maintained by the Ohio Division of Conservation. The water in the marsh is sufficiently shallow so that an observer equipped with sporting boots is able to gain access to all but a very few of the Redwing nests in the area. Regular field work was begun here on June 18, 1940. Nesting activities had begun some time before this date, and it is known that a few young had already been fledged.

Each nest that was found was marked with a numbered cloth tag, and daily visits were made to it sometime between 8:00 A.M. and 1:00 P.M., with a few exceptions due to weather conditions or other circumstances beyond control. For each nest a separate record was kept, showing number of eggs or young, date of hatching, weights and measurements of young. As soon as a newly hatched bird was found in the nest it was marked by tying a colored thread around the tarsus. During the first few days of nest life these threads frequently slipped off. Since it rarely occurred that more than one thread was lost in a given nest few records were lost due to this cause. At the age of four or five days it was found necessary to replace these threads due to the growth of the nestlings.

The age of the nestlings was recorded in terms of days. Each nest was visited at approximately the same hour from day to day, and this method obviously involved an error of almost one day in the recorded age. Efforts were made to correct this error by close observation as to the condition of the bird when it was first found hatched. Wet or moist down was accepted as evidence that hatching had taken place shortly before the nest was visited, and in such cases the birds were not considered one day old until one day after the thread had been attached to the tarsus. The presence of dry, fluffy down together with relatively large bill and tarsal measurements was considered as evidence that the bird in question had hatched sometime the previous day but following my visit. In such cases birds were recorded as one day old. Pipped eggs were also recorded when found, and this was often found useful in helping to estimate the time of hatching.

A few nestlings were dissected in order to determine the sex. At the time of hatching the ovary is a flat, oval-shaped organ about 1.5 millimeters in length. At this age the testes are typically shaped and about .8 millimeters in length. The gonads do not grow at a rate proportional to the rest of the body, but at ten days of age have approximately doubled the dimensions at hatching.

The weights of the nestlings were taken with spring scales having a capacity of 250 grams, marked in 10 gram divisions. The division marks are about 2.5 millimeters apart and estimates were made to the

gram. This permits a large error of measurement, but with practice a fair degree of accuracy is possible. A check was made by taking a few weights with both the spring scales and platform balances. Of ten weights used there was no case in which the two readings varied more than one gram. The spring scales were used because of the difficulty of carrying the more accurate platform balances into the marsh. A small piece of fish line was used to suspend the birds from the scales. It was looped around the base of the wing, or in the case of very young birds, around the wing and neck. Insofar as could be observed no injury was done to the birds, which usually remained motionless while being weighed unless they were old enough to attempt flight.

Measurements of the culmen and tarsus were made with a Vernier caliper. These measurements are very easily made but there is some danger of injury to the young nestlings unless care is exercised in removing the locked caliper from the leg. After many measurements of the culmen had been made it was decided that the differences were too small to be of any great value in distinguishing the sexes and this measurement was discontinued.

Since the complete record of each nest was carried into the field it was possible to determine whether or not the individual birds were gaining weight from day to day. After observing a few birds that had lost weight from the previous day, I noted that these individuals generally died. Later, in order to avoid the loss of valuable records, nestlings which had lost weight from the previous day were removed from the nest and dissections were made to determine their sex. Although as a general practice weights and measurements were taken on all birds, there were unavoidable exceptions to this routine, and consequently the data on weights do not relate to precisely the same numbers and individuals as the data concerning tarsal measurements. It was my privilege to measure and dissect some additional nestlings collected by Mr. Otis Allen in the neighborhood of the Stone Laboratory, Put-in-Bay, Ohio. Data from these birds have been used to supplement my own notes in studying the relation of tarsal length to sex. The material on sex ratio applies exclusively to the Indian Lake colony.

Weights of Nestlings

At hatching the average weight of the Red-wing nestling is approximately five grams. A histogram showing the weights of one day old birds indicates a normal distribution. Although the range increases greatly during the second and third days, it is not until the fourth that a bimodal distribution becomes clearly apparent (Fig. 1). At the fifth ray there is a break definitely separating a light from a heavy group, and this break remains in the graphs for older nestlings, increasing in extent. In the ten day old birds there is a difference of six grams between the heaviest bird in the light group and the lightest individual

of the heavy group. From the eighth day on sixteen birds of known weight were sexed by dissection, and in each case the females fell into the light and the males into the heavy group. It thus seems quite apparent that there is complete differentiation between the sexes with regard to weight during nest life.

In order to trace the development of this dimorphism twenty-five individuals of each sex were selected and their daily weights during nest life were plotted (Fig. 2). The graph offers convincing evidence

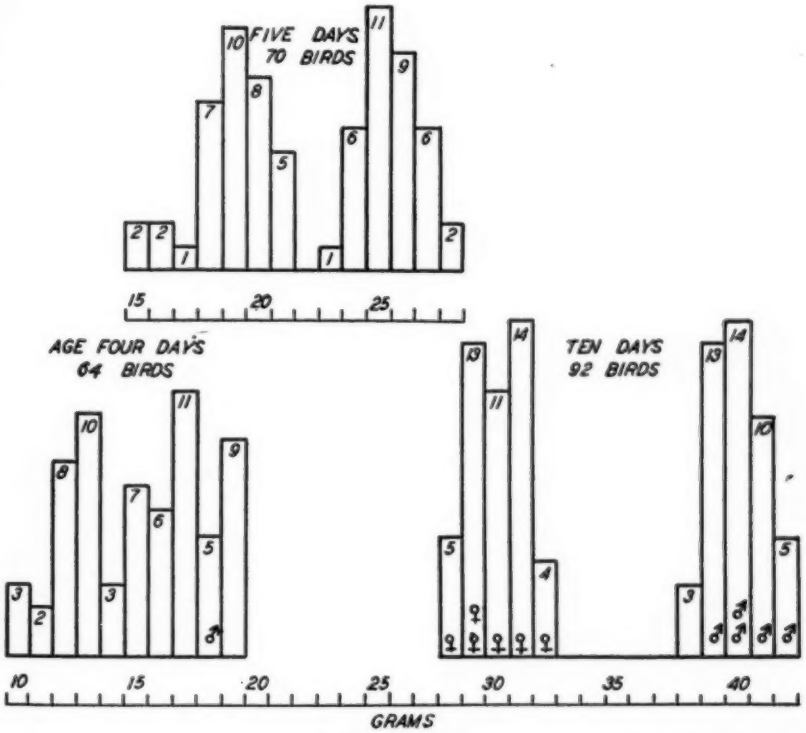

Figure 1. Weights of nestling Red-wings at four, five, and ten days of age. Frequency indicated by figure at top of each column. Each sex symbol represents an individual sexed by dissection.

that the difference in weight between the sexes begins early in the nestling stage. Due to the crude method of weighing used, it did not prove feasible to obtain statistically satisfactory means from these data. It is evident, however, that these samples show no overlap in weights after the fourth day. Since in this study nests were visited at daily intervals, there is a possible error in the method of aging the young which may amount to nearly a day. It can be seen from the data presented graphically in Figure 2 that this possible source of error in aging can

involve error in sexing until the eighth day, since some seven day old males weigh as little as the lightest of the eight day old females. On the ninth day the gap between the two groups is large enough to overcome this source of error in sexing. With more accurately aged nestlings and more refined methods of weighing doubtless the sexes could be distinguished at an earlier age.

Tarsal Lengths of Nestlings

The data on tarsal length were treated in much the same way as those on weights and they show the same general trends (Fig. 3). A

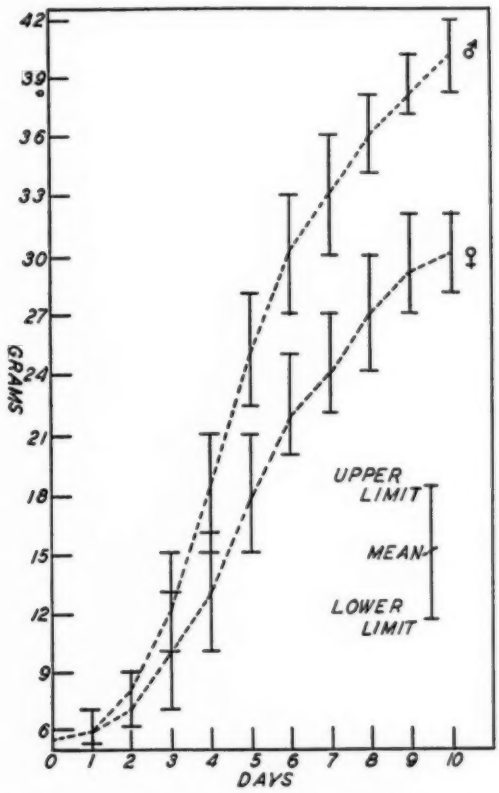

Figure 2. Daily weights of 25 male and 25 female Red-wing nestlings whose identity was known throughout the nestling period. The extent of individual variation is indicated by the length of the vertical bars. The broken line connects the means.

bimodal distribution is indicated at three days, but there is no break between the large and small groups until the eighth day. Even in the ten day old birds the gap is small. That the division into two groups

is associated with sex seems certain, since in a total of fourteen individuals of eight days or older that were sexed by dissection all of the females had tarsal lengths within the range of the small group for the corresponding day, while the tarsal lengths of the males were consistently those of the large group.

These data are based on a more accurate method of measurement than was used in weighing, and are subject to statistical analysis. At ten days the gap between the male and female groups is so small that one might suspect that an overlap would be found in a larger sample. The probability of this can easily be determined to a degree sufficiently accurate for practical purposes. The mean length for the ten day old

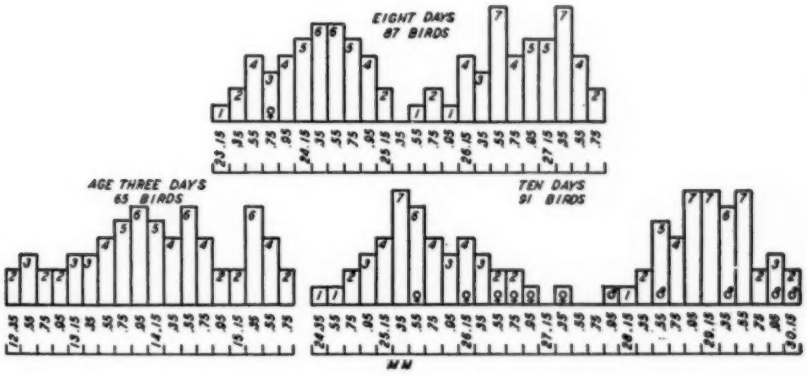

Figure 3. Tarsal lengths of nestling Red-wings at three, eight, and ten days of age. Frequency indicated by figure at top of each column. Each sex symbol represents an individual sexed by dissection.

females is 25.68 millimeters and the standard deviation is .66. For the males the mean is 29.15 and the standard deviation .51. Since in a normal distribution three times the standard deviation taken on either side of the mean includes about 99.75 per cent of the individuals (Simpson and Roe, 1939, p. 118), it follows that the probable limits of tarsal lengths in this population are: for the females, 23.70 to 27.66; for the males 27.62 to 30.68 mm. A negligible amount of overlap is indicated which would affect the accuracy of sexing by this criterion in less than one case in a hundred. It happens that in my data those individuals with tarsal measurements close to this theoretical area of overlap were among those sexed by dissection.

The range of individual variation is sufficiently great that an error in aging might involve an error in sexing even after the ninth day, since some nine day males have tarsi as short as some ten day females. Due to the larger hiatus between the sexes it seems evident that weights offer a more reliable criterion of sex than tarsal measurements.

The relative ease of securing the latter tends to overcome the advantage of using weights, and if the age of the nestlings is accurately known there would seem to be no appreciable error in sexing these nestling Red-wings on the basis of their tarsal length.

Sex Ratio

In his review of sex ratios among birds Mayr (1939) states: "The primary sex ratio of birds is easily obtained because it equals the secondary sex ratio in all those broods where the complete clutch of eggs hatches." In the Eastern Red-wing, however, and in other birds where there is variation in the egg complement it is not easy to decide what constitutes a "complete" clutch. According to Allen (1914, p. 99): "The usual complement is three or four, the one number being as common as the other. Not infrequently five eggs, and rarely six, are found in a nest." In practice however it may occur that an egg is laid outside of the nest or taken by a predator. Departures from the normal complement due to these causes are not easily detected, and in a single sample it is quite possible that such losses might result in a difference between the sex ratios at the time of fertilization and at hatching, that is between the "primary" and "secondary" ratios of Mayr.

In the 67 nests used for this study there were 7 with two eggs, 40 with three eggs, and 20 with four eggs, making a total of 214 eggs and an average of 3.19 per nest. Data concerning the fate of these are summarized in Table 1. In attempting to arrive at a primary sex

TABLE 1

Mortality in 67 Nests Containing 214 Eggs

	Number	Percentage
Eggs stolen or deserted	32	15
Infertile or died in embryo	26	12
Hatched but not fledged	51	24
Fledged	105	49

ratio it seems advisable to eliminate from consideration all nests with two eggs, since it is doubtful that they represent complete sets. Those nests for which records are incomplete, due to presence of sterile eggs, loss of eggs to predators, or loss of young before they reached an age at which sexing was possible, must also be eliminated. My records include complete histories of 35 nests in which there were three or four eggs, all of which hatched. Since undetected losses may have occurred from some of these nests the sex ratio obtained from my records is not to be regarded as a primary ratio but only as the closest possible approximation. The sex ratios in these 35 nests are presented in Table 2. A conspicuous random variation in individual nest combinations is apparent. The ratio of the entire group is 57 males to 62 females (47.9 per cent males, 52.1 per cent females; or 92 males per 100 females). Is the slight excess of females in this sample necessarily in-

dicative of an unbalanced ratio in the population? If we apply the Chi-square method (Snedecor, 1938, Chap. 1) and test the 57:62 ratio against the expected 50:50 the resulting value of Chi-square be-

TABLE 2

SEX RATIO IN 35 NESTS WITH 3 OR 4 YOUNG

Nest ratio	Frequency	Males	Females
4 to 0	1	4	0
3 to 1	4	12	4
2 to 1	9	18	9
2 to 2	8	16	16
1 to 2	7	7	14
0 to 3	5	0	15
0 to 4	1	0	4
Total	35	57	62

comes .210, far below the conventional level of significance. The conclusion is that the 57:62 ratio could easily occur as a random sample in a population with a true ratio of 50:50.

The ratios published by McIlhenny (1940) for the Gulf Coast Redwing are so widely at variance with the ratio found in the Indian Lake birds that it is almost inconceivable that the populations in the two localities are homogeneous with regard to sex ratio. Granting the accuracy of the method of sexing of the Louisiana birds, one can only conclude that conditions as regards sex ratio may be extraordinarily variable among the geographic races of a single species. A comparison with the ratios found by Herman (1938) again yields a striking discrepancy, since he states that in his birds there was a large excess of males (more than two males for one female). In this case a point of technique must be raised. As stated above, Herman's ratios were derived from birds which were banded as nestlings but not sexed until they were trapped sometimes after leaving the nest. There are reasons to question that this method is valid to disclose the sex ratio existing in a group of nestlings. First, the sex ratio in the population at the time of trapping will influence the returns. A surplus of males might result from a higher death rate among the females in the interval between banding and trapping. Another factor which might cause an apparent surplus of males is a greater susceptibility to traps on the part of the males. The existence of either of these hypothetical conditions might affect not only the total returns but also the sibling returns. There is ample evidence in Table 2 of variation in sex ratios among sets of siblings. It seems quite clear that a higher death rate among the females would favor the chance of the return of those sets of siblings which are predominantly males, and a difference in behavior between the sexes which resulted in males entering traps more readily than the females would have the same effect.

During the period from June 18 to July 22 there was fledged from the 67 nests under observation a total of 105 birds. It is possible that this number might have been slightly larger had I not removed certain nestlings which had lost weight. My experience, however, leads me to believe that such birds rarely survive. In arriving at a sex ratio among fledged birds all nests were included from which any birds of known sex were fledged. Of the 105 fledged young the sex was determined in 94 cases, either by weight or by tarsal length. The sex ratio among these birds was exactly balanced, with 47 males and 47 females.

Among the 51 casualties during nest life many losses occurred before the nestlings had reached an age at which sex could be determined by weights or tarsal measurements, and the dead nestlings, which could have been sexed by dissection, were seldom found. The proportion of this loss that was due to predators is not known. Of the 51 young which did not survive to be fledged the sex is known in only 21 cases. Of these 9 were males and 12 females. This suggests that the death rate may have been higher among the females. Testing the 9:12 ratio against the hypothetical even ratio by the Chi-square method yields a value of .428. Since this is far below the level of significance we conclude that the existence of a different death rate between the sexes cannot be established by these figures.

In general the results of the present inquiry fail to demonstrate any marked departure from a balanced sex ratio. It is by no means certain that sex ratios will prove to be the same in other localities within the range of the Red-wing, nor even at Indian Lake in other years. Before general valid conclusions can be reached further studies must be made. Ideally such studies should cover an entire nesting season. It is believed that the technique of sexing the young used in the present investigation should be of value to other workers. Due to the geographic variation in size within the species it will probably be necessary to determine the actual limits of the weights and measurements of the sexes independently in other localities.

Summary

In a study of nestling Eastern Red-wings made at Indian Lake, Ohio from June 18 to July 22 it was found that the young could be sexed by dissection at any time after hatching.

With the age of nestlings known to the nearest day it proved possible to distinguish between the sexes by means of weights after the fifth day, and by means of tarsal lengths after the eighth day.

The following sex ratios were found:

Among 119 young, representing the full egg complements of 35 nests, 57 males: 62 females.

Among 94 young which were successfully fledged, 47 males: 47 females.

Among 21 young which died during the nesting period, 9 males: 12 females.

The apparent deviation of the first and third of these ratios from the expected 50:50 could easily be due to random variation in sampling.

Acknowledgments

I am indebted to Dr. Charles F. Walker of the Stone Laboratory of the Ohio State University at Put-in-Bay, Ohio for advice during the course of the investigation, and for assistance in the preparation of this paper; to Mr. Otis Allen for the use of preserved specimens; and to Mr. E. A. McIlhenny for his courteous reply to my inquiry as to his methods of sexing young Red-wings.

Literature Cited

Allen, A. A.
1914 The Red-winged Blackbird: A Study in the Ecology of a Cat-tail Marsh. *Proc. Linn. Soc. N.Y. Nos.* **24–25.**

Chapman, F. M.
1928 The Nesting Habits of Wagler's Oropendola on Barro Colorado Island. *Bull. Amer. Mus. Nat. Hist.*, **58**, 123–166.

Friedmann, Herbert
1929 The Cowbirds. Charles C. Thomas, Springfield, Ill.

Herman, Carlton M.
1938 Sex Ratios of Banded Eastern Red-wings. *Bird-Banding*, **9**, 92–93.

Lack, David, and John T. Emlen
1939 Observations on Breeding Behavior in Tricolored Red-wings. *Condor*, **41**, 225–229.

Linsdale, J.
1938 Environmental Responses of Vertebrates in the Great Basin. *Amer. Midland Nat.*, **19**, 1–206.

Mayr, Ernst
1939 The Sex Ratio in Wild Birds. *Amer. Nat.* **73**, 156–179.

McIlhenny, E. A.
1940 Sex Ratio in Wild Birds. *Auk*, **57**, 85–93.

Packard, F. M.
1936 Notes on the Plumage of Eastern Red-wing. *Bird-Banding*, **7**, 77–80.

Roberts, Thomas S.
1932 The Birds of Minnesota. University of Minnesota Press, Minneapolis.

Simpson, George G., and Anne Roe
1939 Quantitative Zoology. McGraw-Hill Book Co. N.Y.

Snedecor, George W.
1938 Statistical Methods. Collegiate Press Inc., Ames, Iowa.

Lakeview, Ohio

GENERAL NOTES

Egg Weights of some Arctic Nesting Birds.—During the early summer of 1940 the writer accompanied Mr. Lawrence I. Grinnell of Ithaca, New York, on a trip to Churchill, Manitoba, for the purpose of collecting data on certain birds and mammals of that region. Mr. John Cruttenden of Quincy, Illinois, was also at Churchill during part of our stay there, collecting a limited number of eggs of various species of birds. With his kind permission I recorded in grams the weights of certain of the sets which he secured, as follows.

Pacific Loon (*Gavia arctica pacifica*), two sets: 101.3, 100.4 and 93.4, 98.6 (average, 98.4), both taken on June 17 and partly incubated.

Semipalmated Plover (*Charadrius semipalmatus*), three sets: 9.4, 9.4, 9.9, June 17; 8.7, 8.9, 9, 9.3, June 18; and 9.9, 10, 10.3, June 21 (average, 9.5). A fourth egg of the third set was blown by mistake before being weighed. Stage of incubation of these sets not recorded.

Hudsonian Curlew (*Phaeopus hudsonicus*), one set: 42.4, 45.7, 46.6, 48 (average, 45.7), taken June 18, slightly incubated.

Least Sandpiper (*Pisobia minutilla*), three sets: 4.2, 5.4, 5.7, 5.7 and 5.6, 5.7, 6.2, taken June 17; and 4.7, 4.9, 5.1, 5.1, taken June 18. The lightest egg of the first mentioned clutch was cracked and therefore, omitting this one, the remaining ten average 5.4 grams. None were very far advanced in incubation.

Dowitcher (*Limnodromus griseus hendersoni*), one set of three about three days after completion of the clutch: 16.7, 17.3, 17.6 (average, 17.2), taken June 18. I personally collected and sexed the incubating bird, which proved to be a female.

Stilt Sandpiper (*Micropalama himantopus*), one set: 10.4, 10.9, 10.9, 11 (average, 10.8), taken June 21 when slightly incubated.

Semipalmated Sandpiper (*Ereunetes pusillus*), two sets: 7.2, 7.2, 7.5, 7.6, taken June 17; and 6.7, 6.9, 7, 7.1, taken June 18 (average, 7.2). The former were incubated about one week, while the latter were fresh.

Northern Phalarope (*Lobipes lobatus*), two sets: 5.8, 6.2, 6.3, 6.4 and 6.2, 6.2, 6.4, 6.5 (average, 6.3), both taken June 17 and stage of incubation not noted.

Arctic Tern (*Sterna paradisaea*), two sets: 16.9, 17.4 and 16.5, 17, 17.2 (average, 17), taken June 17. Both sets were slightly incubated.—RALPH S. PALMER, *Ithaca, New York.*

Black Vulture and Red Fox Found in Unusual Association.—On June 17, 1939, Mr. J. W. Webb, an employee of the Alabama Cooperative Wildlife Research Unit, found an occupied den of the red fox (*Vulpes fulva*) in a large rocky outcrop about ten miles west of Auburn, Lee County, Alabama. While searching for other entrances to the fox den, he discovered a nest of the Black Vulture (*Coragyps atratus atratus*) containing a nestling approximately a week old. The rocks, known locally as "Buzzard Rocks," have provided nesting sites for Black Vultures for years.

The nest was situated on a rock shelf overhung by a huge boulder, a location typical of Black Vulture nesting sites in this region. On being approached, the young bird paid little attention to the observer, neither attempting to hide in the deeper recesses of the pocket nor showing other evidences of fear. Judging from the size of the nestling and the fact that it exhibited no fear, it was estimated to be from four to eight days old. Young Black Vultures over a week old almost invariably display fear and defiance when their nest is visited for the first time.

Under the rocky slab was a large crevice extending directly beneath the nest and continuing an undetermined distance into the outcrop, gradually narrowing to a passage about 12 inches in diameter. Just back of the nest the slab ended,

allowing the upper and lower crevices to unite. This arrangement provided two avenues by which the adult birds could leave the nest; the first, by the upper entrance; the second, by way of the lower opening (see photograph). To use the lower exit the birds had to leave the nest from the rear, jump down some two feet to the crevice floor and then pass to the outside. There was some evidence that both avenues were being used.

Upon examination it was discovered that the lower entrance was being used regularly by foxes and that the lower passageway was apparently one way of entering their den. This opening showed considerable recent use and den refuse was scattered nearby.

The nest was visited again on June 29, at which time an adult vulture was flushed from the nest. The nestling at this time was approximately one-fourth as large as a mature bird but was still entirely covered with yellow juvenile down. On this visit, the young bird ran to a corner of the crevice, hissed loudly and regurgitated its latest meal of a DeKay's snake (*Storeria dekayi*) and some well digested, unidentifiable meat particles. The foxes were apparently still using the lower entrance. The fallen tree just below the lower arrow (see photograph) showed evidence of having been gnawed extensively by the foxes while they played or searched for insects. The remains of a chicken and several rabbits which they had captured since the first visit were found nearby.

Since the fox is supposed to be very fond of eating birds' eggs, young birds, and even grown ones, it is interesting to note that these foxes had not disturbed the nestling or the parent birds, even though they had easy access to them. Not only had they not been disturbed, but the birds had been allowed to use part of the den entrance. The foxes apparently preferred to catch and transport chickens from a farm house some three-fourths of a mile or more away rather than eat the Black Vultures—a preference for which the foxes could hardly be blamed!—FREDERICK S. BARKALOW, JR., *Department of Conservation, Box 469, Auburn, Alabama.*

Snow-killed Bobwhite Covey—While making the routine spring check-up at the Faville Grove game management area at Lake Mills, Wisconsin, on April 22, 1940, in company with Arthur S. Hawkins of the Illinois Natural History Survey, we came upon a covey of Bobwhite Quail (*Colinus virginianus*) that had died during the previous winter.

The hapless covey was found in a small copse of second-growth oaks with an undergrowth of wild raspberry, grape, and dried weeds. The copse is triangular, bounded by grazed pasture, tamarack swamp, and oat stubble on its three sides. The birds had evidently gone to roost on the leeward side of the copse, and on the leeward side of a grape tangle, in an open growth of raspberry and weeds. The date of their demise must have been after January 5, 1940, for on that date Hawkins flushed a covey from this same copse and counted sixteen birds. On January 14 an 8.7 inch snow fell during the night and then drifted. It seems likely that our covey was unable to dig out of the drift and fell victim to starvation in their "snow prison." Eight bodies were found, still arranged in rosette formation. What happened to the other eight birds? Some may have died between the date last seen and the date of the storm. Some certainly were removed from the roost by scavenging animals, for one wing and a few breast feathers were found eight feet from the "death circle."

A feeding station that had been operated during the winter stood, as if in mockery, but 25 yards to the south of the dead covey.

Both crop and gizzard contents were too far gone to be identified. The plumage was used to sex and age the birds. The sex ratio was four males to five females. Five of the eight birds were young ones, of which three were males.

But for this one storm, the winter of 1939–40 was comparatively mild. It would appear, therefore, that sudden storms may prove to be as disastrous as continuously severe weather. Few snow-killed coveys have been recorded. Douglas E. Wade (*Bird Lore*, 40, 1938: 7–10) has traced the separate fates of a covey scattered during a blizzard, but we know of no published account of an entire covey found dead on the roost.—ROBERT MCCABE and ALDO LEOPOLD, *University of Wisconsin, Madison, Wisconsin.*

Red Phalarope and Other Water Birds at Lexington, Virginia.—The following notes are supplementary to two former papers in *The Wilson Bulletin* (47, 1935: 59–67 and 49, 1937: 48–9). The two previous papers listed 56 forms for Rockbridge County. Since then five additional species have been recorded. Of land birds, 180 forms have been recorded, making a total of 241 species and subspecies for this mountain county.

KING RAIL. *Rallus elegans elegans.*—On May 15, 1940, one of these birds, alive and in good condition, was brought to me. It had been captured while trying to get through a fence in a chicken yard on South Buffalo Creek, eight miles from Lexington. The friend who showed the bird to me promised to release it.

YELLOW RAIL. *Coturnicops noveboracensis.*—One was captured on September 29, 1937, and brought to me alive. It was later released. The man who captured it saw others at the same time.

PURPLE GALLINULE. *Ionornis martinica.*—One, of which I have the skin, was captured on May 16, 1940, on South Buffalo Creek, about ten miles from Lexington (*Auk*, 57, 1940: 566). A more unlikely place for such a bird than this mountain stream could scarcely be imagined.

WHITE-RUMPED SANDPIPER. *Pisobia fuscicollis.*—My daughter, Jane, and I found one of these birds at a rain pool in a field two miles north of Lexington, on September 30, 1940. I had close views of the bird for some time with 8X glasses, flushing it several times to observe the white rump. The next day I tried without success to collect the bird. At times it was in company with Killdeers, and again with a small flock of Pipits. This species is extremely rare in western Virginia.

RED PHALAROPE. *Phalaropus fulicarius.*—On September 30, 1940, my daughter and I found a phalarope swimming about in shallow water at Cameron's Pond, a mile north of Lexington. I thought that it was a Northern Phalarope, but it seemed too large, so I went home for a gun and collected it. The heavy bill and blue-gray back identified it as a Red Phalarope. The moult to winter plumage was not complete, the bird being considerably darker than typical winter specimens. It was a female, and fairly fat. There are only three previous records for Virginia, all of them curiously enough being inland records (Montgomery County; 50 miles up the Potomac from Washington, D.C.; and Charlottesville).

Additional records on certain other birds have been made during the four years since the last paper was published. I have one summer record, July 27, 1937, for the Pied-billed Grebe (*Podilymbus podiceps*). Professor R. S. Freer saw another Double-crested Cormorant (*Phalacrocorax auritus*) in James River at Snowden, just outside our area, on May 8, 1937; and I saw an immature bird on North River inside the city limits of Lexington on October 19 and 22, 1939. The American Egret (*Casmerodius albus egretta*) now occurs not uncommonly from June 22 to October 1. Several years ago a Black Duck (*Anas rubripes*) joined a flock of domestic ducks at Big Spring Pond, and has mated regularly with one of the females each summer since. A female wild Mallard (*Anas platyrhynchos*) at the same place mated with a domestic drake and nested successfully in 1938 and 1939. The Sora (*Porzana carolina*) is much less common than formerly, because of the drying up of suitable small marshes. I now have a number of records for the Ring-billed Gull (*Larus delawarensis*) in September, December, February, and several years in April; and several additional March and April records for the Bonaparte's Gull (*Larus philadelphia*).—J. J. MURRAY, *Lexington, Virginia.*

Community Bathing of the Cedar Waxwing.—While waiting at Glen Haven, Michigan, on June 7, 1940, for the boat to South Manitou Island, we noticed an interesting habit of a flock of Cedar Waxwings (*Bombycilla cedrorum*). Between 55 and 60 Waxwings were in a small aspen tree next to a pool of stagnant water in a depression on the beach of Lake Michigan. Some of the birds were bathing in the water while others were sitting quietly or preening themselves in the tree. Periodically one or several of the bathing birds would fly up into the tree and almost immediately they would be replaced at the pool by others from the tree. Thus there were always about 15 or 20 birds from the flock bathing at any one time. A considerable portion of the pool was never used by the birds, and the bathing individuals kept close together. The weather was cloudy and cool with occasional light rain. The flock was still bathing when we left, nearly an hour after we had first noticed them.

On July 5 during another visit to Glen Haven a flock of about the same size as before was noted bathing in the pool. Their behavior was the same as on the previous occasion for they not only used the same tree but the same end of the pool. The day was clear and warm, and the flock spent most of the afternoon bathing. The nesting activities of mid-summer may have brought to an end the community bathing habits of the Waxwings as observations made on July 29, 30, and August 1 disclosed no birds bathing at the familiar pool.—ARTHUR E. STAEBLER and LESLIE D. CASE, *Museum of Zoology, University of Michigan, Ann Arbor, Michigan.*

EDITORIAL

The twenty-sixth Annual Meeting of the Wilson Ornithological Club, held November 21 to 23 at the University of Minnesota Museum of Natural History in Minneapolis, was one of the largest and most successful we have ever had. Details and proceedings of the meeting will appear in the March *Bulletin*.

The Club needs very much copies of the December, 1908, and March, 1916, *Wilson Bulletin*. Members who know of copies which are not being used are asked to communicate with the Editor.

In response to the requests which have come in, we are having made a few reprints of the "Short Papers" section of this issue. These copies will be printed on only one side of the paper so that they may be cut up to form card index bibliographies of current literature or special topics. We will have a limited number of extra copies to supply those who have not ordered them in advance.

The Wilson Ornithological Club wishes to thank Mr. J. B. Semple of Sewickley, Pennsylvania, for his generous gift which makes it possible to publish the handsome colored plate that illustrates this issue.

A gift from William Youngworth of Sioux City, Iowa, enables us to publish two more large photographs in this issue than would otherwise have been possible.

We wish to express here our sincere thanks for the editorial assistance received during the past year from Maurice Brooks, Helen T. Gaige, Harry W. Hann, Harrison F. Lewis, Waldo L. McAtee, Theodora Nelson, and Max M. Peet.

OBITUARY

Francis H. Herrick died on September 11, 1940, in his eighty-second year. He was the leading authority on Audubon and was the author of the definitive biography of that great naturalist. Professor Herrick was one of the very early leaders in the field of bird photography and published in 1901 one of the first books on the subject. He also spent a number of years studying the nest life of the Bald Eagle, but even more important in the development of American ornithology were his invaluable, pioneering papers on the psychology and nesting habits of birds.

Frank S. Hall died on July 7, 1940, while returning by train from Puget Sound to Spokane. After serving on the staff of the University of Michigan Museum from 1907 to 1909, he went to Washington to serve as curator of the Washington State Museum and later as director of the Spokane Public Museum. Long a leader in natural history work in the Pacific Northwest, he was principally responsible for the founding of the Pacific Northwest Bird and Mammal Society and its excellent journal, *The Murrelet*.

Willis W. Worthington, noted naturalist and bird collector, died at Shelter Island, New York on October 4, 1940, in his seventy-ninth year. He was famous for his skill in the field, and his excellent bird skins are familiar to every museum worker. He had made many trips, especially for Carnegie Museum, to Mexico, the West Indies, and various parts of the United States.

Robert W. Williams, Chief Counsel of the U. S. Fish and Wildlife Service, died in Washington, D. C., on September 19, 1940. He had served the United States government in various kinds of conservation work for nearly forty years and had a notable record of accomplishment.

ORNITHOLOGICAL LITERATURE

LIFE HISTORIES OF NORTH AMERICAN CUCKOOS, GOATSUCKERS, HUMMINGBIRDS AND THEIR ALLIES. ORDERS PSITTACIFORMES, CUCULIFORMES, TROGONIFORMES, CORACIIFORMES, CAPRIMULGIFORMES AND MICROPODIIFORMES. By Arthur Cleveland Bent. United States National Museum Bulletin 176, 1940. viii + 506 pp. 73 plates. $ .75. Supt. of Documents, Washington, D. C.

This is the thirteenth of Mr. Bent's valuable volumes on life histories of North American birds and a very fine volume it is. The six orders included offer such a variety in their habits that the volume makes fascinating reading. Notable chapters have been contributed by Messrs. E. C. Stuart Baker, Alexander Skutch, George Sutton, and others. Very interesting is the account of the Khasia Hills Cuckoo (*Cuculus canorus bakeri*): the sexes are "promiscuous in their sexual relations"; the female sometimes adopts a territory from which she excludes all other females "parasitic on the same foster parent," but not females "parasitic on a different species"; eggs were collected from one cuckoo for 11 years; incubation usually takes 12 or 13 days. "The period the nestling remains in the nest is 4 to 6 weeks, but in many cases the nest is far too small to retain the young cuckoo until it is full grown," and this is often disastrous to the bird. Unlike our Cowbird, "The young Khasia Hills cuckoo ejects the fosterer's eggs or young from the nest in the same way as its English cousin does, possessing the same interscapulary pit to assist it in doing so. This structural aid to ejection is found in all such genera as *Cuculus*, *Cacomantis*, *Penthoceryx*, and others that eject their foster brothers and sisters, but not in the young of *Clamator*, *Eudynamis*, and those cuckoos that do not commit such murders. In the cuckoos that possess it, the pit soon fills and young cuckoos lose the impulse to eject after a very short time, sometimes within 4 days and almost invariably within a week of being hatched."

Ringed Kingfisher (*Megaceryle t. torquata*) parents take turns of 24 hours each when incubating the eggs, each bird taking a single recess in the afternoon. The young stay in the nest about 35 days, some 10 days longer than young Belted Kingfishers. Dr. Gross gives a long account of nesting of the Eastern Nighthawk on the roof of a building, Dr. Sutton a lively chapter on the Roadrunner.

A charming life history is given by Mr. Skutch of the White-eared Hummingbird (*Hylocharis l. leucotis*), "one of the most abundant and familiar hummingbirds" of the Guatemalan highlands. After the rainy season from May to October, in "November and December, the first months of clear sunny weather, there is a greater profusion of bright, conspicuous blossoms than at any other period of the year. Hummingbirds of all kinds nest during this flowery season, despite frequent cold, biting winds, and the frosts that from November to the end of March form almost nightly on open fields above 7,500 feet." All the other birds wait till spring to nest. Male White-ears congregate into "singing assemblies," each bird perched from 60 to 100 feet from his neighbor; some of these groups gave a "clear, silvery tinkle," others a "chirping note." "The territorial rights of each white-ear were respected by the others, and as a rule each sounded his little tinkle without much interference from his neighbors." "The female white-ear built her nest alone, without the assistance or even the encouragement of one of the males that sang so tirelessly beyond sight and hearing." "If ever nestlings seem to need the ministrations of a father, to help feed them and to warm them while the mother takes her recesses and seeks her food, it is these little hummingbirds; yet no male ever appears to aid in their care, for this is not the custom among hummingbirds." One mother still fed her 40 day old son of the first brood, although she was now incubating her second set of eggs. The chapter should be read and enjoyed in toto.

It would sometimes be better if Mr. Bent did not quote quite so widely, or if he quoted more reliable authorities. For instance, the account of Bralliar of the mother Belted Kingfisher teaching her young to catch fish until "she was convinced of the skill of each of her brood" is a bit too plausible to be convincing. It is too bad to cite erroneous statements as to the length of the incubation period of the Ruby-throated Hummingbird (14 and 11 days) and omit two of the reliable observations that show it to be at least 16 days, or to repeat the wild statement that the young of this species may stay in the nest only 6 days when they really stay some 3½ weeks.

The index and full bibliography are of great value, while the hundred and forty odd photographs deserve the highest praise. Mr. Bent is to be heartily congratulated upon his thirteenth volume.—M. M. Nice.

Birds of Lucas County [Ohio]. By Louis W. Campbell, Bulletin Toledo Zoological Society, 1, No. 1, October 1, 1940: 6 x 9 in., 1–225, folding map. $.50.

This report of the birds found in a county in northwestern Ohio concerns an area of approximately 342 square miles of land and 275 square miles of water. The field work covered a period of 13 years, from January 1, 1926 to December 31, 1939. There is an introduction containing brief accounts of the physical geography of the county, various bird habitats, migration lanes, effects of weather on birds, and a history of bird life in former years. Following that is an annotated list of the recorded 285 species and 13 additional subspecies of birds, plus 3 hybrids (2 warblers and a junco); a hypothetical list of 5 species, and a list of 16 birds of possible occurrence. There are 5 appendices, in tabular form, which include important data on extreme and average dates of arrival and departure of transient and summer resident forms. An index of the scientific and common names of birds completes the report. Typographical errors are few and the format is pleasing. Unfortunately there are 2 shades of paper, divided into 4 sections, which detract from the otherwise pleasing appearance of the book. Despite this, the Toledo Zoological Society has produced, in this new series, a nicely printed publication.

Mr. Campbell states that the purpose of the report is (1) to acquaint the people of northwestern Ohio with the bird life of the area, and (2) to include sufficient scientific data to make it of value to ornithologists. To do this it was necessary to combine popular appeal with scientific accuracy, a difficult "carrying of water on two shoulders" which has been creditably accomplished. The writing is at all times clear, although occasionally one wishes an account had been more detailed. Although credit is given to many individuals and several organizations the majority of the field work obviously has been done by Mr. Campbell. Most of the unusual bird records made by him are validated by preserved specimens that are deposited in museums, and one finds little to criticise and much to commend in his personal observations. However, at times he appears to have placed too much faith in the observations of others, by accepting sight records as positive which should be questioned (see Eastern Blue Grosbeak, p. 163).

The author is fortunate in living in Lucas County. This county, with its great diversity of habitats, is situated at the western end of Lake Erie, at the junction of at least two important migration routes, and it therefore unquestionably contains one of the richest avifaunas of any Ohio county. This region has been sadly neglected in the past, which aids in making Campbell's contribution of more than usual importance to ornithologists. It is a source of satisfaction, in this day of paid fellowships, grants, and other subsidies, to find a naturalist enthusiastic enough to expend freely so much of his own time and effort in the production of a thorough report like this one. Mr. Campbell is to be congratulated.—Milton B. Trautman.

THE ECOLOGY AND ECONOMICS OF THE BIRDS ALONG THE NORTHERN BOUNDARY OF NEW YORK STATE. By A. Sydney Hyde. Roosevelt Wildlife Bulletin, 7, No. 2:62–215, figs. 26–57, map. Oct., 1939 (Copy received May, 1940).

This paper deals with the birds inhabiting a narrow, 500-mile strip of territory along the south shore of Lake Ontario from Point Breeze to a point on the New York-Quebec boundary northeast of Chateaugay. The field work was done during June, July, August, and early September in 1935 and 1936.

The title is woefully misleading. Three fourths of the pages are devoted to an annotated list of 176 species plus a hypothetical list of 17 species of the summer, spring, and fall birds. The remaining pages are concerned with general descriptions of the area and its bird life; of these pages, *three* deal directly with ecology and *two* with economics. What therefore appears to be a fresh approach to the study of the birds of an extensive, rich area is actually an old-style annotated list!

The text is decidedly popular. For example, the Catbird (p. 167) is spoken of as a "slender slaty slinker." Original observations are numerous and commendable but all too often they are buried amid a jumble of remarks that have no specific application to the birds of the area in question. The information presented under each species follows no plan: the status may be mentioned under one but not the next; descriptions of coloration, plumage, song, and behavior are given under some species but not all of them.

The purpose of this paper is undoubtedly a guide to the birds of the region but it is shadowed by an inappropriate title and poor organization. The paper is profusely illustrated with many excellent photographs.— O. S. Pettingill, Jr.

SHORT PAPERS

AUSTIN, OLIVER L. Some Aspects of Individual Distribution in the Cape Cod Tern Colonies. *Bird-Banding*, 11, No. 4, Oct., 1940: 155–69, map.

BAKER, BERNARD W. Notes on Sandhill and Little Brown Cranes in Texas. *Jack-pine Warbler*, 18, No. 3, July, 1940:74–7, figs. 1–2.

BARTLETT, HARLEY H. The Reports of the Wilkes Expedition, and the Work of the Specialists in Science. *Proc. Amer. Phil. Soc.*, 82, No. 5, June, 1940:601–705. (Includes sections on the ornithological work of Peale and of Cassin. The new birds in Peale's extremely rare volume are listed, together with Cassin's disposition of each in his revised "edition" ten years later).

BIRD, C. G., and E. G. BIRD. Some Remarks on Non-breeding in the Arctic, especially in North-east Greenland. *Ibis*, 1940, Oct.:671–8.

BLAKEMORE, LEM A. Barred Owl Food Habits in Glenwood Park, Minneapolis, Minnesota. *Flicker*, 12, No. 3, Oct., 1940:21–3.

BOND, RICHARD M. Birds of Anaho Island, Pyramid Lake, Nevada. *Condor*, 42, No. 5, Sept., 1940:246–50, figs. 70–3.

BRAUND, F. W. Lincoln's Sparrow Breeding on the Upper Peninsula of Michigan. *Jack-pine Warbler*, 18, No. 3, July, 1940: 67–8, fig. 1.

BRODKORB, PIERCE. New Birds from Southern Mexico. *Auk*, 57, No. 4, Oct., 1940: 542–9. (New subspecies of *Sterna albifrons, Tapera naevia, Chordeiles acutipennis, Chloroceryle amazona* and *americana, Aulacorhynchus prasinus, Cissilopha yucatanica, Heleodytes zonatus, Dendroica graciae, Agelaius phoeniceus, Saltator atriceps, and Aimophila rufescens*).

BRODKORB, PIERCE. A New Hawk from Southern Mexico. *Univ. Mich. Mus. Zool. Occ. Papers No.* 425, Nov. 30, 1940:1–4. (*Buteo magnirostris petersi* subsp. nov. from "above Arriaga, Chiapas").

BROOKS, ALLAN. An Estimate of Our Hawks. *Field and Stream*, 45, No. 3, July, 1940:21–4, 61–5, 85. (Fully illustrated in black and white with the author's pictures).

BROWN, FRANK A. JR., and MARIE ROLLO. Light and Molt in Weaver Finches. *Auk*, 57, No. 4, Oct., 1940:485–98.

CHAPMAN, FRANK M. Señor Sparrow. *Nat. Hist.*, 46, No. 4, Nov., 1940:200–4, illus. (An excellent popular account of the author's geographical study of *Zonotrichia capensis*).

CHENAULT, TANDY P. The Phenology of Some Bob-white Food and Cover Plants in Brazos County, Texas. *Jour. Wildlife Management*, 4, No. 4, Oct., 1940: 359–68.

CRILE, GEORGE, and DANIEL P. QUIRING. A Record of the Body Weight and Certain Organ and Gland Weights of 3690 Animals. *Ohio Jour. Sci.*, 40, No. 5, Sept., 1940:219–59. (Many diverse species of birds are included).

DAVIS, DAVID E. Social Nesting Habits of *Guira guira*. *Auk*, 57, No. 4, Oct., 1940: 472–84.

DEADERICK, WILLIAM H. An Annotated Bibliography of Arkansas Ornithology. *Amer. Midl. Nat.*, 24, No. 2, Sept., 1940:490–96.

DEAR, L. S. Breeding Birds of the Region of Thunder Bay, Lake Superior, Ontario. *Trans. Royal Canadian Inst.*, 23, Pt. 1, Oct., 1940:119–43. (Address: 198 College St., Toronto, Ont.).

DEUSING, MURL. Bald Eagle Range and Population Study. *Passenger Pigeon*, 2, No. 9, Sept., 1940:103–6, photo, map. (In Wisconsin).

EDNEY, J. M. The Sandhill Crane in Middle Tennessee. *Jour. Tenn. Acad. Sci.*, 15, No. 4, Oct., 1940:401.

EMLEN, JOHN T., JR. The Midwinter Distribution of the Crow in California. *Condor*, 42, No. 6, Nov., 1940:287–94, figs. 79–80.

ENGLAND, E. G. A Nest of the Arctic Three-toed Woodpecker. *Condor*, 42, No. 5, Sept., 1940:242–5, fig. 69. (In Sierra County, Calif.).

ENGSTROM, HUGH R. 1940 Minnesota Nesting Records. *Flicker*, 12, No. 4, Dec., 1940:46–52.

ERICKSON, ARNOLD B. Editions of Wilson's "American Ornithology." *Flicker*, 12, No. 4, Dec., 1940:44–6.

FLEETWOOD, RAYMOND J. Birds of the Piedmont National Wild Life Refuge. *Oriole*, 5, No. 3, Sept., 1940:25–8. (A nominal list of the 137 species recorded in this Refuge in Jones and Jasper counties, Ga.).

GANIER, ALBERT F., and ALFRED CLEBSCH. Summer Birds of Fall Creek State Park. *Migrant*, 11, No. 3, Sept., 1940:53–9. (In Van Buren and Bledsoe counties, Tenn.).

GROSS, ALFRED O. The Migration of Kent Island Herring Gulls. *Bird Banding*, 11, No. 4, Oct., 1940:129–55, 1 photo, 2 maps. (Also treats in some detail the returns from 1,409 gulls banded on the Great Lakes).

HIBBERT-WARE, MISS A. An Investigation of the Pellets of the Common Heron (*Ardea cinerea cinerea*). *Ibis*, 1940, July:433–50.

HOWARD, WILLIAM J. Wintering of the Greater Snow Goose. *Auk*, 57, No. 4, Oct., 1940:523–31.

KENDEIGH, S. CHARLES. Factors Affecting Length of Incubation. *Auk*, 57, No. 4, Oct., 1940:499–513.

KIRKMAN, F. B. The Inner Territory of the Black-headed Gull. *Brit. Birds*, 34, No. 5, Oct. 1, 1940:100–4.

LACK, DAVID. Variation in the Introduced English Sparrow. *Condor*, 42, No. 5, Sept., 1940:239–41.

LACK, DAVID. Habitat Selection and Speciation in Birds. *Brit. Birds*, 34, No. 4, Sept., 1940:80–4.

LACK, DAVID. Pair-formation in Birds. *Condor*, 42, No. 6, Nov., 1940:269–86.

LOWNES, ALBERT E. A Collection of Seventeenth-century Drawings. *Auk*, 57, No. 4, Oct., 1940:532–5.

LOYSTER, E. L. Waterfowl Banding in Southern Wisconsin. *Passenger Pigeon*, 2, No. 8, Aug., 1940:95–7, illus.

MILLER, LOYE. Observations on the Black-footed Albatross. *Condor*, 42, No. 5, Sept., 1940:229–38, figs. 65–7.

NELSON, URBAN C. Winter Observations on Pheasants in Southeastern Minnesota. *Jour. Wildlife Management*, 4, No. 4, Oct., 1940:369–72.

NICE, MARGARET M., and JOOST TER PELKWYK. 'Anting' by the Song Sparrow. *Auk*, 57, No. 4, 1940:520–22, 2 text figs.

NOBLE, G. K., and M. WURM. The Effect of Testerone Propionate on the Black-crowned Night Heron. *Endocrinology*, 26, No. 5, May, 1940:837–50, figs. 1–13.

OWEN, J. H. Birds Brooding on Empty Nests. *Brit. Birds*, 34, No. 5, Oct. 1, 1940: 105–6.

RANKIN, M. NEAL, and DENIS H. RANKIN. Additional Notes on the Roosting Habits of the Tree-Creeper. *Brit. Birds*, 34, No. 3, Aug., 1940:56–60. (Roosting habits of *Certhia, Parus*, and *Troglodytes* studied experimentally by mounted bird technique).

ROBERTS, T. S. Calder's Statuette of Alexander Wilson. *Flicker*, 12, No. 4, Dec., 1940:39, 1 pl.

RYSGAARD, G. N. Wilson's Birds. *Flicker*, 12, No. 4, Dec., 1940:40–1. (With a list of the 32 species of birds first described and named by Alexander Wilson).

SELIGMAN, O. R., and J. M. WILLCOX. Some Observations on the Birds of Jan Mayen. *Ibis*, 1940, July: 464–79.

SIBLEY, CHARLES G. The Warbling Vireo of the Cape District of Lower California. *Condor*, 42, No. 5, Sept. 1940:255–8, figs. 75–6. (*Vireo gilvus victoriae* subsp. nov. from Victoria Mts., Lower Calif.).

SIMON, JAMES R. Mating Performance of the Sage Grouse. *Auk*, 57, No. 4, Oct., 1940:467–71, pls. 8–9.

SKUTCH, ALEXANDER F. Some Aspects of Central American Bird-Life. I. Family Life in a Non-migratory Bird Population. *Sci. Monthly*, 51, No. 5, Nov., 1940: 409–18, 10 photos.

STEVENS, O. A. Bird Banding in the Last Five Years. *Bird Banding*, 11, No. 4, Oct., 1940:169–73, 2 maps.

SUTTON, GEORGE, and THOMAS D. BURLEIGH. Birds of Valles, San Luis Potosi, Mexico. *Condor*, 42, No. 5, Sept., 1940:259–62.

SWANSON, GUSTAV. Food Habits of the Sharp-tailed Grouse by Analysis of Droppings. *Jour. Wildlife Management*, 4, No. 4, Oct. 1940:432–36.

SWANSON, GUSTAV. The Minnesota Ornithologists' Union. *Flicker*, 12, No. 4, Dec., 1940:42–3.

TAVERNER, P. A. Canadian Status of the Long-tailed Chickadee. *Auk*, 57, No. 4, Oct., 1940:536–41, 2 text figs.

TICEHURST, N. F., and H. F. WITHERBY. Report on the Effect of the Severe Winter of 1939–40 on Bird-life in the British Isles. *Brit. Birds*, 34, No. 6, Nov. 1, 1940:118–32, 3 photos.

TRIMBLE, RUTH. Changes in Bird Life at Pymatuning Lake, Pennsylvania. *Annals Carnegie Mus.*, 28, Art. 6: 83–132, pls. 8–11.

VAIDEN, M. G. Interesting Mississippi Birds. *Migrant*, 11, No. 3, Sept., 1940:66–8.

VAN DERSAL, WILLIAM R. Utilization of Oaks by Birds and Mammals. *Jour. Wildlife Management*, 4, No. 4, Oct., 1940:404–28.

VENABLES, L. S. V. Nesting Behaviour of the Galapagos Mockingbird. *Ibis*, 1940, October:629–39. (*Nesomimus*).

WATSON, FRANK G. A Behavior Study of the White-tailed Kite. *Condor*, 42, No. 6, Nov., 1940:295–304.

WING, LEONARD. A Study of Wintering Tennessee Crow Specimens. *Jour. Tenn. Acad. Sci.*, 15, No. 4, Oct., 1940:358–70.

YEATES, G. K. Some Notes on the Bittern. *Brit. Birds*, 34, No. 5, Oct. 1, 1940: 98–9, photo. (*Botaurus stellaris*).

ZIMMERMAN, F. R. The Ruddy Duck in Wisconsin. *Passenger Pigeon*, 2, No. 10, Oct., 1940:111–16.

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MANUSCRIPT. Manuscripts should be typed on paper of good quality and of letter size (8½ x 11). Write on one side only and use double spacing. The title should be brief and carefully constructed so as to indicate clearly the subject. Ordinarily the scientific names of the birds treated should be given and should appear early in the article. Most articles should have a brief summary at the end.

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